RWANDA ENVIRONMENTAL THREATS AND OPPORTUNITIES ASSESSMENT

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Acknowledgements

Rwanda is a complex country with a significant endowment of natural resources managed by a wide variety of institutions. Attempting to describe the "state of the environment" and to analyze threats to Rwanda's environment and natural resources in only three weeks is a formidable task. Nevertheless, the Environmental Threats and Opportunities Analysis (ETOA) Team believes that it has made a contribution by providing at least a snapshot of what the major environmental issues, threats, and opportunities are today.

The consultants that conducted this assessment acknowledge the support of the many Government of Rwanda agencies, USAID partners, private businesses, and non- government and civil society organizations that opened their doors to help make this work useful. We thank them all for our frank discussions and for their great enthusiasm, determination, energy, and commitment to protecting Rwanda's environment. The team would like especially to express its appreciation to Andy Karas and Tim Muzira of the USAID Mission to Rwanda, who are important supporters of the analysis and findings.

Due to time constraints, no original research was conducted. Although the team sought to maximize the use of available quantitative data, the assessment depended largely on secondary research. We would therefore like to thank the contributors to the many reports that facilitated this assessment.

The conclusions of this work are those of the authors and do not necessarily reflect the views, implicit or explicit, of USAID or the Government of the United States.

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TABLE OF CONTENTS

ACRONYMS

ACNR	Association for the Conservation of Nature in Rwanda
ADAR	Agribusiness Development Assistance in Rwanda
ANP	Akagera National Park
ARECO	Rwandan Association of Ecologists
AREDI	Rwandan Association for Integrated Development of the Environment
AWF	African Wildlife Federation
BCDI	Bank of Commerce and Development and Industry
BED	Berggorilla and Regenwald Direkthilfe
CCC	Civilian Conservation Corps
CEPGL	Economic Community of Countries of the Great Lakes
CRS	Catholic Relief Services
CTO	Cognizant technical officer
CURPHAMETRA	University Center for Pharmacy and Traditional Medicine
DAP	Development Assistance Projects
DFGFE	Diane Fossey Gorilla Foundation / Europe
DFGFI	Diane Fossey Gorilla Fund / International
DFID	Department for International Development
DRC	Democratic Republic of Congo
DRSA	Regional Agricultural Services Office
EGAT	Economic Growth, Agriculture, and Trade
EIA	Environmental impact assessment
ETOA	Environmental threats and opportunities assessment
FAA	Foreign Assistance Act
FAO	Food and Agriculture Organization
FFI	Fauna and Flora International
FFW	Rwandan franc
FHI	Family Health International
FIDA	International Agriculture Development Fund
GDP	Gross domestic profit
GEF	Global Environment Facility

GOR	Government of Rwanda
GTZ	German Development Cooperation
ICRAF	International Center for Research in Agroforestry
IEE	International environmental examination
IGCP	International Gorilla Conservation Project
INRS	National Institute for Scientific Research
IRST	Institute for Scientific and Technological Research
ISAR	Rwanda Institute of Agronomic Sciences
ISP	Integrated strategic planning
ITFC	Institute for Tropical Forest Conservation
ITN	Insecticide-treated mosquito net
IUCN	International Union for Conservation and Nature
KAP	Knowledge, attitudes, and practices
KIST	Kigali Institute of Science, Technology, and Management
MET	Ministry of Environment and Tourism
MGVP	Mountain Gorilla Veterinary Project
MINAGRI	Ministry of Agriculture, Livestock and Forestry
MINALOC	Ministry of Local Administration, Information, and Social Affairs
MINEDUC	Ministry of Education, Science, Technology, and Scientific Research
MINERENA	Ministry of Energy and Natural Resources
MINICOM	Ministry of Commerce, Industry and Tourism
MININFRA	Ministry of Infrastructures
MINISANTE	Ministry of Health
MINITERE	Ministry for Lands, Human Resettlement, and Environmental Protection
MINITRAP	Ministry of Public Works and Energy
NFR	Nyungwe Forest Reserve
ORINFOR	Rwandan Office of Information
ORN	Rwanda Bureau of Standards
ORTPN	Rwandan Office of Tourism and National Parks
PEARL	USAID Partnership for Enhancing Agriculture in Rwanda through Linkages
PNLP	National Anti-malaria Program
PNV	Volcano National Park

PRA	Participatory rural assessment
PRSP	Poverty Reduction Strategic Plan
PSI	Population Services International
REMA	Rwanda Environment Management Authority
RSSP	World Bank Rural Sector Support Project
SME	Small and medium-sized enterprises
SO	Strategic objective
SOPYWRA	Pyrethrum Society of Rwanda
STTA	Short-term technical assistance
UCB	Belgian Chemical Union
UNDP	U. N. Development Program
UNEP	U. N. Environment Program
UNR	National University of Rwanda
UPEGAZ	Unit for Promotion and Exploitation of Methane Gas
WCS	Wildlife Conservation Society
WFP	World Food Program
WHO	World Health Organization
WRI	World Resources Institute
WWF	World Wildlife Fund
WV	World Vision

EXECUTIVE SUMMARY

Background

USAID/Rwanda is currently writing a five-year Integrated Strategic Plan (ISP: 2004-2008) that will be aligned with the Government of Rwanda's (GOR's) Poverty Reduction Strategic Plan (PRSP), which has become the guiding strategy for all GOR development efforts. Aligning USAID/Rwanda's program with it will signal support for the GOR's poverty reduction strategy and will enhance synergy across sectors, and increase management efficiency.

Because USAID/Rwanda recognizes that wise management of natural resources is essential to the success of any development program, it contracted with Chemonics International through the BIOFOR IQC to conduct an Environmental Threats and Opportunities Assessment (ETOA) for Rwanda. The ETOA will inform the Environmental Annex of the USAID/Rwanda Integrated Strategic Planning (ISP) process. This report is the product of that assessment.

The formal environmental requirements of USAID operating unit strategic plans specified in ADS 201.3.8.2 Mandatory Technical Analysis for Developing Strategic Plans, Environmental Analysis, and are derived from the Foreign Assistance Act (FAA) and 22 CFR 216. (The relevant sections of the FAA can be found in Annex A of this report.) These dictate concern for:

- Environmental Sustainability. Section 117 of the FAA *"Environment and Natural Resources,"* dictates that operating units will implement their programs with an aim toward maintaining (and restoring) natural resources upon which economic growth depends, and to consider the impact of their activities on the environment.

- Tropical Forestry and Biological Diversity. Sections 118 *"Tropical Forests"* and 119 *"Endangered Species"* of the FAA codify the more specific U.S. interests in forests and biological diversity. These two provisions require that all country plans include: 1) an analysis of the actions necessary in that country to conserve biological diversity and tropical forests; and 2) the extent to which current or proposed USAID actions meet those needs. Section 118/119 analyses are specific legal requirements of all USAID operating unit strategic plans.

- Agency Environmental Procedures. 22 CFR 216 provides the basis for the application of pertinent US environmental legislation and policy. This legislation and supporting guidance from USAID/Washington directs Missions to conduct assistance programs in a manner that is sensitive to the protection of endangered or threatened species and their critical habitats within the project activity cycle. While FAA Sections 117-119 address the analytic requirements for USAID Missions during the strategic planning process, 22 CFR 216 is designed to guide the evaluation and conduct of specific development interventions within the project development and management cycle.

This report supports the USAID strategic planning process by providing a broad overview of threats to the environment in Rwanda. The findings are based on available data and interviews with expert informants within and outside the Mission. While the ETOA is primarily concerned

with the condition and framework of forest and biodiversity conservation in Rwanda, and the likely effects of the Mission's proposed strategic plan, it also places forests and protected areas within a broader economic context. As specified in the scope of work, the team sought to address the relative severity of broader environmental threats; similarly, the section on opportunities addresses the concerns of a broad range of parties who might be interested in addressing environmental threats in Rwanda. The Mission and ETOA team have striven to integrate the PRSP within the landscape ecology that governs Rwanda's sustainable economic growth.

Purpose

The specific objectives of this ETOA were to:

- Document the state of key natural resources by quantifying trends in their management, biophysical condition, productivity, abundance, and distribution and by identifying threats (e.g., degradation, depletion, pollution) to which they are subjected.

- Analyze how past events and current initiatives (both Rwandan and donor) have shaped the country's development trajectory.

- Review and analyze current and proposed GOR policies, laws, institutions, and initiatives that are related to the environment/natural resource sector.

- Analyze gaps in the knowledge base, both within and beyond the purview of existing agencies.

- Conduct an environmental review of proposed USAID/Rwanda strategy components, particularly proposed SO 3, "Expanded Economic Opportunities in Rural Areas," to identify or emphasize environmental threats and opportunities in light of the FAA requirements.

- Evaluate Rwanda's tropical forest and biodiversity resources and how well the current and proposed ISP respond to FAA Sections 118 (Tropical Forests) and 119 (Endangered Species).

- Identify opportunities and entry-points for USAID/Rwanda efforts that would positively influence the conservation of tropical forests and biodiversity and improve environmental management.

The Chemonics team consists of a senior expatriate natural resource and environmental management specialist, James R. Seyler, and a Rwandan environmental policy analyst, Jean Marie Mugemana, with administrative and logistical support from the Chemonics ADAR office. The findings, conclusions, and recommendations of the team are theirs alone; they do not necessarily reflect the policies of the United States Government.

The Rwandan Context

Rwanda is a small, mountainous, landlocked country covering 26,328 $km^{2;}$ it is characterized by vast hills and mountains interspersed with valleys. Rwanda has been described as country of a

thousand hills (*mille collines)* because of the numerous highly dissected hills, separated by deep valleys.

Rwanda's hydrology is characterized by a dense network of lakes, rivers and wetlands. Wetlands (large permanent swamps) and marshlands (seasonal grass swamps – *marais*) occupy about 10 percent of the country and comprise three large swamps and numerous small *marais* scattered among the hills. These latter systems are the most physically and chemically heterogeneous of all the aquatic ecosystems in Rwanda and are in effect seasonal wetlands.

Rwanda contains a wide variety of species due in part to the varied topography, which is responsible for diverse regional climatic conditions. Despite this rich biodiversity, endemism is not thought to be high. Vegetation can best be described as a regional mosaic that includes sections of the Guineo-Congolian and Sudanian vegetation. The total area under forest cover was reduced by about 57 percent between 1960 and 1996. The GOR's need to permanently resettle the millions of returnees since the 1994 war, and to supply the people with fuel, land, and shelter, has led to the almost total destruction of Giswati and Mukura forest reserves. This downward trend in afromontane forest cover is thought to be continuing.

Rwanda has a population of about 8.16 million people with an annual growth rate of about 3.0 percent and an average population density of about 317 people per km^2, one of the highest in Africa. Over 60 percent of its people are too poor to meet their basic human needs. Approximately 3.5 million Rwandese have been displaced or returned from abroad in recent years; many are still homeless.

Preliminary census data indicate that 16.7 percent of Rwandans live in urban areas, a significant increase since 1991. This suggests an urgent need for viable economic activities that increase the earning power and improve living standards for the rural population. This is even more critical with the expected demobilization of thousands of Rwanda soldiers and ex-combatants and the release of those imprisoned in the Gacaca genocide trials. As of 2002 almost half of the Rwandan population (48.6 percent) was under the age of 16. The youthfulness of the population and its high population growth rate and density has had a huge effect on natural resources, the environment, and all public services.

Malnutrition; malaria and other water-related diseases; high fertility; and HIV infections have brought high infant and child mortality (107 IMR), pushing average life expectancy down to 40. One child in five (19.6%) dies before its fifth birthday. HIV/AIDS prevalence is estimated at 8.9 percent nationally. Malaria is the greatest cause of morbidity, followed by diarrhea and respiratory infections. In rural areas, access to safe water may have declined to around 44 percent.

Constitutional and Policy Framework

The current constitution does not address environmental issues, but the constitution that will be presented for referendum in May/June 2003 ensures the protection and sustainable management of the Rwandan environment. It should encourage rational use of Rwanda's environmental resources.

In Rwanda, as in many other African countries, the Ministry of Agriculture has controlled the environmental sector. Although Rwanda had a national environmental strategy in 1991, the Earth Summit in Rio in 1992 provided the impetus for specific sustainable development programs. After Rio, Rwanda signed and ratified several international conventions for the protection and the conservation of the environment, from The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) through the U.N. Convention to Combat Desertification. Ratifying these international instruments made it possible for Rwanda to obtain financing (e.g., from the Global Environmental Facility and the U.N. Environmental Program) to implement its national environmental strategies.

After the war in 1994, Rwanda adopted a policy of intensified agriculture to respond to the food needs of its people. The GOR then recognized the need to refine its national environmental strategy and environmental action plan (1996) and its national strategy for biodiversity (2000). Together these address such environmental priorities as poverty, food security, and the energy crisis; land management planning based on the characteristics of affected ecosystems; forestation and biodiversity; the future of wetlands; climate change at the national level; and urban environmental management and pollution control.

The National Decentralization Policy adopted in May 2000 holds local populations responsible for managing resources, including natural resources. By addressing the environment at subnational levels, the policy should make an enormous contribution. Districts are responsible for production and protection of water, tourism, and the environment. Similarly, cities, towns, and municipalities are responsible for land and environmental management, urban planning, road maintenance, maintenance of protected and recreational areas, and providing drinking water, sanitation, and waste treatment and disposal.

However, the ratification and implementation of many of the above policies and strategies have been very limited to date.

Legislative Framework for Environmental Management

Because the environment is a relatively new political concern in Rwanda, there are few specific and relevant laws. Some older laws do regulate natural resource use; among them the Forest Code and laws on fishing and aquiculture, land tenure, pollution of water resources, conservation and land use, protected areas, and public health.

With the help of the UNEP, a national environmental law was drafted in 2000, but it has not yet been passed. This law outlines major principles of management and protection as inspired by the international conventions Rwanda has signed. The draft deals with management and use of agricultural land; imports and exports of animal and vegetable products; the control of substances contributing to air pollution; standards for management of dangerous wastes; how mandatory environmental impact assessments (EIAs) must be organized (the expense to be born by the project promoter); standards for environmental protection and for imported products; and protection of wetlands and rivers. Other draft laws not yet passed deal with sanitation, the use of marshlands, conservation and management of wetlands, protected areas, and land tenure. Once these pass, the implementing regulations may then take a long time to draft.

Indeed, for political and structural reasons even the current environmental regulations are not well enforced—a situation that undermines environmental management and protection.

Institutional Framework for Environmental Management

In Rwanda, managing and protecting the environment is the responsibility of the Ministry for Lands, Human Resettlement, and Environmental Protection (MINITERE) and coordinated by its Directorate of Environmental Protection. Since 1994, the ministry has been short of human and material resources. MINITERE has proposed creation of the Rwanda Environment Management Authority (REMA) to coordinate environmental management more broadly. Without legislation that will give teeth to REMA, control of the environmental sector is now scattered throughout a number of ministries, with very little coordination and often a great deal of redundancy and even conflict in approaches.

Environmental Status, Threats, and Opportunities

A. Aquatic Resources

Lakes and Rivers: Rwanda's hydrological network includes at least 19 major lakes and 8 major rivers. This network and its wetlands contain a wide variety of plant, animal, and aquatic species; 104 plant species alone have been recorded. All are threatened by coastal habitat destruction; water extraction; exotic species; fishing in breeding grounds; household and industrial pollution; and sedimentation.

The GOR has decided to privatize Lake Ihema, giving the fishing concession to a local company, Societe de Peche de Mutara (SOPEM). The Rwandan Office of Tourism and National Parks (ORTPN) is also proposing Ihema as a RAMSAR site. While the RAMSAR convention permits sustainable exploitation of resources like fish, this is predicated on sound knowledge of the resource base (fish stocks), a specified allowable harvest, and a monitoring plan to ensure compliance. The GOR needs to be sure that these are in place before SOPEM begins operations.

Earlier, MINAGRI introduced an exotic carnivorous fish (*Protopterus aethiopicus*) into Lake Muhazi to control a burgeoning mollusk population, but the species may be harming indigenous fish and invading other lakes and rivers. Its ecological impact needs further study.

Wetlands and Marshlands: Rwanda's wetlands act as a buffer in flood or overflow plains, reducing maximal flow rates during the rainy season and maintaining relatively high flow rates during the dry season. Environmentally fragile, the marshlands need safeguards to maintain their ecological integrity when used for agricultural production. Total marshland area is estimated at 168,000 ha; a conservative estimate is that some 94,000 ha of this has already been exploited for agriculture and livestock farming. Rehabilitating farmed marshlands is a major element of both GOR and donor activities to increase rural incomes, reduce poverty, and reinforce national stability, but even without development activities, many marshlands are threatened by silting and reduced water retention due to continued vegetation loss and erosion; the pressure of more people using unsustainable land use practices on nearby hillsides; and the downstream impacts of declining water quality.

A watershed/catchment approach would best mitigate environmental problems. The main elements of a catchment approach are to (i) buffer zones of natural vegetation created at intervals to control water flow, reduce downstream impact, help filter out effluents from other activities, and provide fodder for livestock and materials for thatch; and (ii) zoning of marshland areas and restricting cultivation of habitats that are critical for water storage or breeding habitats for wild animals.

A watershed approach could: (i) restore soil hydration, thus increasing soil moisture; (ii) improve soil structure, increasing organic matter with no change in the water table; (iii) improve microclimate amelioration, if combined with good agroforestry practices; (iv) improve crop yields; (v) increase the biodiversity of soil fauna and flora and other plants and animals, especially water birds; and (vi) possibly support agriculture that integrates crop production, livestock, and aquaculture.

Other opportunities to enhance the marshlands are to draft environmental criteria for selecting marshlands to be rehabilitated, and to use social assessments to identify constraints to ownership and maintenance of infrastructure.

Lake Shore Resources: Rwanda has about 300 km of coastline along Lake Kivu. Most of the hillsides above the lake are under coffee production (generally low fertilizer inputs, no run-off, and good slope stabilization), which is good for the environment, but the proposal to build small methane electricity platforms on the lake (see section 8.6) may attract other enterprises and the attendant risks of pollution. At some point, the GOR must plan how to mitigate the environmental impacts of lakeside industrial development.

B. Savanna Ecosystem

Akagera National Park (ANP) (Wooded Savanna): In the 1960s ANP formed part of the Akagera - Lake Mburo ecosystem extending north into Uganda and east into Tanzania. Today, this ecosystem is entirely fragmented and its wildlife population is found only in small disturbed enclaves. Under the 1993 Arusha Accord, it was resolved that returning Rwandan refugees would be settled into open unsettled areas; the areas deemed most suitable were the ANP and the Mutara Hunting Reserve.

After the genocide of 1994, resettlement became increasingly urgent. In 1997, the Mutara Reserve was degazetted and the area of the ANP area was reduced by two-thirds, leaving only 1,081 km^2.The result has been a severe loss of biodiversity in three formerly protected ecosystems: the subhumid savanna in the west; the floodplains of the central valley; and the *Acacia kirkii* gallery forest to the north. Loss of these ecosystems, it is estimated, carries with it the total loss of 15 percent of the tree and shrub species and 20 percent of the herbaceous species of the former ANP and Reserve. The loss of this habitat will result in a further decline of all wild fauna species in the area. Although tourism is fairly high, the future status of the park is in question.

The most immediate threat to the new ANP comes in the form of the 270,000 cattle in the region surrounding the park. Many returnees brought herds with them from Uganda, more than

doubling the cattle population in four years. The resulting grazing pressure has been a prime factor undermining the park's vegetation and wildlife.

In areas inside the park where grazing pressure is heavy—as is agriculture encroachment, charcoal production, tree cutting for firewood and construction, and deliberately set fires—there has been an extensive decrease in nutrient-rich grasses and an increase in annual grazing weeds. Gully erosion, particularly along trails used by cattle, has also increased. There has been a continuous notable decline in the numbers of animals in the park, attributable to the severe reduction of range and to vegetation degraded by overgrazing and poaching.

Rehabilitating the ANP would be a positive step, but before this can happen, the grazing issue needs to be addressed at the highest levels of government; donor and civil society pressure will be necessary.

C. Forest Ecosystems

Afromontane Forest Ecosystems: Rwanda's afromontane forests used to run the length of the Nile-Congo crest but population pressure now limit them to those in the forest reserves of Nyungwe, Giswati and Mukura, and the Volcano National Park (PNV). Because Giswati and Mukura have been used for cattle grazing and resettlement, only small isolated patches of forest remain there, in inaccessible areas. These forests are important to protecting Rwanda's watersheds. An African Development Bank project is attempting to rehabilitate Gishwati and Mukura by enrichment plantings of natural species, but if the areas can be protected, natural or assisted regeneration would likely be more effective and less costly.

Nyungwe Forest Reserve: Nyungwe Forest Reserve is globally as well as nationally important for the conservation of several restricted-range species found only in the Albertine Rift ecoregion in Africa. The reserve is home to 13 species of primate, 1,068 plant species, 85 mammal, 278 bird, 32 amphibian, and 38 reptile species. In all 62 species of fauna and about 250 plant species are endemic to the Rift.

Nyungwe's socioeconomic importance is as significant as its biological importance. The reserve is the watershed for over 70 percent of Rwanda; its streams feed both the Congo and the Nile basins. It thus protects the watershed of not only surrounding communities but also communities much further downstream. The buffer zone around the forest has been planted with economically important species and is a source of building poles and firewood for local populations. Honey production and the harvesting of medicinal plants are other important economic activities.

Nyungwe faces several major threats derived largely from population growth, pressure on land resources, lack of sustainable sources of income for local communities, and limited awareness and availability of economic incentives for sustainable use of biodiversity. Poaching of large mammals is high. Fires caused by beekeepers smoking bees from wild hives have spread, devastating large forest areas; and mining of gold and more recently columbo-tantalite has led to creation of large mining camps in the forests.

Finally, the absence of large ungulates in the forest appears to have upset Nyungwe's ecological balance, especially in burned areas. As there are no animals to graze away the ferns and grasses that proliferate after a fire, they remain on site and hamper seed dispersal and germination.

Legislation now before Parliament would make Nyungwe a national park, a classification that in theory at least would make all human activities in the park illegal. The ETOA team believes restricting local access to the park may result in even more degradation. We recommend that ORTPN take a community co-management approach in Nyungwe, permitting but controlling community access to the reserve for medicinal herb collection, honey production (using improved hives), and similar activities.

It is also important to devise incentives for communities to protect the forest. This requires that GOR: (i) identify and remove any disincentives and implement incentives that promote fair distribution of park benefits; (ii) promote market-based incentives for green-labeled tea and improved hives/honey production; develop on-farm herbs/medicinals and bamboo; and show farmers how to link crops to markets; and (iii) set up FFW programs (monetized) for in-park activities (trail, road and bridge maintenance/construction, etc.).

Volcano National Park: The PNV is one of the oldest protected areas in Africa; it was established by King Albert of Belgium in 1929 in an effort to set aside the Virunga Mountains in the DRC, Rwanda, and Uganda to save the habitat of the last representatives of the mountain gorilla. Over half the current mountain gorilla population is found in the three national parks sharing the Virunga Mountains (the rest are in Bwindi). Five of the eight dormant volcanoes that make up the Virunga chain are in Rwanda.

The PNV contains 245 species of plants, 115 species of mammals, 187 species of birds, 27 species of reptiles and amphibians, and 33 species of arthropods. Among the plants, 17 species are threatened, of which 13 species of orchids are internationally protected. Many plant and animal species in the park other than the gorilla have gone unstudied, but the International Gorilla Preservation Project (IGCP) is now working with ORTPN to habituate two groups of golden monkeys for tourism.

Threats to the park include poaching of gorillas and other wildlife, wood cutting, bamboo harvesting, medicinal plant collection, and beehive placement. Local community options for alternatives to park use are very limited and costly. Though revenues generated by gorilla tourism are quite high, little if any is returned to the communities. The ETOA team strongly recommends that ORTPN draw up a revenue-sharing scheme that returns a percentage of tourism proceeds to local communities for investment in activities lost as a result of denied access to the forest.

Gallery Forests: Gallery forests are strips of forest along watercourses or extending from wetlands. In Rwanda their area has been significantly reduced by clearing for agriculture, bush fires, and cutting for fire and construction wood. Gallery forests are now found only in the eastern along the Akagera river system, covering an area of about 163 ha. Gallery forests contain a number of rare, endemic species, some of which have potential for modern as well as traditional medicine, but their commercial exploitation could have negative environmental consequences on the few remaining gallery forests if no safeguards are put in place.

D. Agriculture

Crop Production and Farming Systems. Agriculture is the mainstay of Rwanda's economy. Approximately 91 percent of the population depends on the sector, which is estimated to contribute about 40 percent to GDP and 30 percent to export earnings. Arable land covers about 1,385,000 ha, some 52 percent of total land area. Per capita land holdings average only about 0.6 ha per family. The main food crops are bananas, beans, sorghum, sweet potatoes, Irish potatoes, cassava, maize, and rice. Vegetables are mainly tomatoes, cabbages, and peas.

The main environmental threat to Rwanda's farming systems is erosion, because most agriculture is done on steep slopes. Hillsides typically suffer the least erosion in their natural state of forests or grassland. When soils are disturbed or left without protective cover, as is the case with agricultural row crops, hillsides lose as much as 80 to 100 m^3 of soil per ha per year; fields become infertile after only three or four years. As chemical fertilizers cost too much to be used in most traditional farming systems and few organic fertilizers are used, increases in agriculture production are difficult to achieve.

Opportunities: Well-maintained terracing and other protective measures can significantly reduce erosion, as can perennial crops like tea and coffee that provide significant vegetative cover and do not disturb the soil regularly. Protecting hillsides is a strong rationale for supporting the coffee subsector. Recognizing erosion as a major problem, the GOR intends to accelerate terracing, reforestation, and marsh management programs via public works programs financed by the World Bank's PRSP project.

However, the ETOA team questions the use of radical terraces and paying farmers to build terraces on their own land. Although radical terraces can substantially increase yields through water and organic matter retention, there are other valuable forms of on-farm environmental improvements, such as progressive terracing, grass strips, and other agroforesty combinations. The ETOA team recommends that the GOR study the public works concept for such improvements in greater detail, looking into alternatives to paying farmers for environmental improvements on their own farms and do a cost/benefit comparison of terracing techniques and a socioeconomic analysis of the use of different terracing techniques on a single farm. The goal would be a rational, cost-effective farm soil conservation strategy and plan.

Grazing and Animal Husbandry: Rwanda's main cattle-grazing areas are in the prefectures of Umutara, Kibungo, Kigali rural, and Gitarama. Cattle and their products (milk, cheese, leather, and butter) are estimated to have contributed 4 percent to GDP in 1998, but cattle populations have now increased to the point that rangelands are severely degraded. The overgrazing is exacerbated by the fact that many of these cattle are not high-quality meat or milk producers but are kept as a traditional symbol of wealth and prestige. The GOR needs a strategy (and eventually policy and legislation) to address the social and environmental issues inherent in traditional extensive livestock systems.

Agricultural Enterprises

Tea and Fresh Cut Flowers: Production of both tea and fresh cut flowers is agrochemical-intensive. Fields are often in marshland areas where agrochemicals can contaminate surface

water. Record-keeping and training and supervision of employees or subcontractors in proper applications needs improvement. USAID and other donors should consider providing technical assistance to tea and cut-flower producers on how to set up and maintain pesticide training records and materials. Training should emphasize more systematic attention to the use and control of safety equipment for pesticide and fungicide handlers.

Pyrethrum: Pyrethrum is an ecofriendly crop grown on the region's rich volcanic and well-drained soils; it requires only small amounts of fertilizer, normally manure. The environmental threat is in the distillation process. Pyrethrum distillation uses hexane, a highly flammable solvent that is unstable at temperatures above freezing. Hexane is a mobile and potent neurotoxin metabolized in the liver; long-term exposure through inhalation, ingestion, or skin contact can lead to permanent disabilities. Many countries discourage its use. In Rwanda, stocks of hexane are poorly documented; it appears that leaks are a serious fire hazard. The refrigeration system uses chlorofluorocarbon and more than 1,500 lbs of this ozone-depleting chemical are poorly stored; inventory records are inadequate. There are also significant environmental health and safety issues with regard to operation of the distillation plant.

USAID and other donors supporting agribusinesses could encourage better agrochemical management through walk-through audits, hands-on training, teaming international and proven local consultants, and involving the Rwandan Bureau of Standards and the new Environmental Protection Unit.

Coffee-Washing Stations: Prices for commodity coffee are the lowest in years, and some farmers are pulling up coffee trees and replacing them with row crops. Because depulping or "washing" coffee is critical to maintaining coffee quality through the final drying and roasting phases, it is necessary to meet quality requirements in the specialty coffee market, which last year paid triple the price of commodity coffee. That is why USAID and other donors emphasize establishing and managing washing stations.

Coffee washing has high water requirements, generates substantial quantities of pulp waste, and discharges washing and fermentation water. USAID's ADAR has been working with both ACDI/VOCA and the PEARL project to specify designs for washing stations and to train engineers in appropriate design. Stations should also be sited consistent with the environmental framework law currently moving through Parliament, which will prohibit discharging virtually any waste into wetlands or rivers.

Washing stations should be doing everything possible to prevent pulp from entering receiving waters and enhance the oxygenation of those waters. Perking fields for fermentation water should be established on permeable and well-drained soils, preferably outside floodplains. The use of reconstructed wetlands for rapid uptake of nutrients and carbohydrates is an option USAID might investigate. It is recommended that the manual ADAR consultants are writing for coffee station installation and management have a chapter on identifying and mitigating environmental problems.

E. Energy

Wood Fuel: Traditional fuels currently meet 90 percent of Rwandan energy needs. A World Bank study predicts that at the current rate of population growth and biomass utilization, if current energy practices do not change, Rwanda will be able to supply only 37.2 percent of its fuel wood needs in 2010. This figure does not take into account the proliferation of small to medium-scale agri-businesses that use wood for fuel. The threat is that the shortfall in supply will be made up by using Rwanda's forest capital, its forest reserves and parks—as has already occurred in the Gishwati and Mukura reserves. The study concluded that those first affected will be rural households; major enterprises, such as tea factories, will still be able to access sufficient fuel.

Because alternative fuels to wood for commercial purposes are not available in the short to medium term, the predicted shortfall must be met by better conservation and replanting and increased efficiency in usage. USAID and other donors should work to build the management capacity of enterprises to ensure they have a plan for securing the energy they need at a reasonable cost. This may mean experimentation with alternative energy sources but may equally focus on obtaining wood at an acceptable cost. USAID and other donors could work with tea estates to plant model forests that could stimulate additional employment while improving watershed management. Availability and cost of energy could be integrated into USAID's screening process for supporting agribusiness-related projects.

Methane: Lake Kivu in western Rwanda holds about 55 billion m^3 (STP) of methane, and commercial exploitation may be possible. The Belgians built several plants during the colonial era, at least one of which is still in operation. The plant can produce 1.0 to 1.5 million m^3/year, though it is often offline due to maintenance problems. All the gas produced is sold to the Bralirwa brewery.

Currently, the GOR, with the assistance of the World Bank, is drawing up regulations for accelerated exploitation of the Kivu gas reserves. A Rwandan company jointly owned by BCDI (Bank of Commerce and Development and Industry) and the Bralirwa brewery has been formed to promote a prototype gas recovery and power generation installation.

There have been several incidents in Africa and elsewhere of significant loss of life due to lakes releasing toxic volumes of methane. Use of improper techniques to exploit the methane may upset the equilibrium that keeps the dissolved methane in place, possibly resulting in a catastrophic accident. On the positive side, methane extraction might reduce emissions and convert Kivu into a harmless, living lake.

The ETOA team recommends that USAID limit itself to the use of STTA to help MINITERE draft environmental guidelines and terms of reference for EIAs of construction and operation of the extraction platforms, including guidelines for monitoring both the lake and the atmosphere. The STTA should also examine GOR capacity and technical support for environmental monitoring of this type of technology.

Given USAID's limited resources, the ETOA team recommends promotion of private fuel wood production over methane. For an equivalent amount of energy, wood fuel cost is approximately

35 percent of the cost of methane. While gas burns more efficiently and has the added benefit of retarding deforestation, the population of Rwanda is though to be too dispersed, the economic and infrastructure development too low, and the price of wood fuel too low to make gas substitution practical.

F. Health-Related Issues

Medical Waste Disposal: A random survey conducted by Family Health International (FHI) at twelve health centers throughout Rwanda concluded that only two centers had satisfactory systems for collecting and disposing of wastes. The majority of centers: (i) did not have functioning incinerators; (ii) did not block off public access to disposal sites; and (iii) burned wastes in the open air or simply threw them in uncovered holes.

While medical and paramedical personnel tend to take necessary precautions, maintenance personnel and care givers have very limited knowledge of the risks of handling medical waste. Legislation has not kept up with today's realities. Although the Ministry of Health has master plans for health center construction that include waste disposal sites and incinerators, there are no environmental guidelines. The ETOA team is also concerned that the type of incinerators proposed in the MOH plans may not get hot enough to ensure adequate incineration.

Opportunities for USAID and other donor interventions are: (i) helping MINISANTE and MINITERE and their partners draft a national strategy for medical waste disposal and update legislation; (ii) writing guidelines for siting waste disposal sites at health centers and ensuring that the MOH incinerator design is adequate for proper incineration; (iii) putting together a public awareness campaign on the dangers of handling medical waste; and iv) training health center personnel, particularly those charged with maintenance and disposal, on proper waste disposal.

Anti-Malaria Control. Malaria is a leading cause of mortality and morbidity among both children and adults. The expenses of treatment and the opportunity cost of the illness in terms of lost productivity drain household resources nationwide. USAID supports Population Services International's (PSI) insecticide-treated mosquito net (ITN) project in Rwanda. PSI, in collaboration with the USAID Regional Environmental Officer, first prepared a detailed Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) for ITNs. The plan represents Rwanda's environmental review and risk/benefit assessment of the use of deltamethrin in the treatment of mosquito nets. It concluded that PSI/Rwanda is handling, storing, packaging, and disposing of the insecticide carefully and educates the population about it.

G. Biodiversity

Biodiversity Status. Rwanda shelters 2,150 species of plants, and the assumption is that the degree of endemism is quite high. The UNEP World Conservation Monitoring Centre lists eight species of trees as either threatened or others of "conservation concern" in its tree conservation database.

The American Museum of Natural History lists 87 species of amphibians and reptiles in Rwanda. The only reptile species listed with concern is a tortoise.

Rwanda is one of Africa's top birding countries; an incredible 670 different species have been recorded. Four species of birds are threatened of extinction: the shoebill stork found in Akagera; Grauer's rush warbler found in PNV, Nyungwe, and the swamps of Rugezi; the kungwe apalis found in the Nyungwe; and the African or Congo bay owl.

Rwanda contains 151 different types of mammal species, 11 of which are currently threatened and none of which is endemic. The country is particularly well known for its 14 to 16 species of primates, most prominent among them the world's most endangered ape, the mountain gorilla found in PNV. Others are the mountain monkey in the Nyungwe National Park, the endangered chimpanzee in Nyungwe and the golden monkey, endemic at a certain altitude in PNV.

Principal Threats to Biodiversity. The principal threats to biodiversity stem from human influence, legal and institutional causes, and natural causes.

- Human influence. There is a high degree of human disturbance in 66 percent of the area in Rwanda, and a medium degree in the remaining 34 percent. No piece of land has remained undisturbed. With the influx of more displaced persons and an increase in competition for arable land, the percentage of high disturbance is likely to increase. Deforestation was estimated at 2.3 percent per year between 1980 and 1990, and forested areas are still under attack. Nyungwe has lost more than 1,000 ha, PNV is being nibbled at, Akagera has lost more than 50 percent of its area, Mutara no longer exists, and Gishwati has practically ceased existing as a forest reserve. The losses in protected areas are both traditional and a reflection of the economic situation. The increases in population in Rwanda have brought increased demand for cleared land for cultivation and for fire and construction wood, as well as grazing and wildlife poaching. Poverty and the lack of alternative income-generating opportunities, fires (either natural or deliberate), and the introduction of exotic species (e.g., the water hyacinth) also undermine biodiversity.

- Legal and institutional causes. There is a general lack of motivation and incentive to conserve biodiversity, particularly for communities near protected areas. The ministries that protect and manage protected areas are also institutionally weak, with overlapping mandates; shortages of equipment, resource, and qualified personnel; weak collaboration with local administrators, and minimal enforcement of the laws..

- Natural causes. Erosion and landslides, drought, floods, and disease also have an impact, as does the proliferation of competitive species.

Biodiversity Conservation. The GOR's biodiversity conservation efforts focus on:

- Protected Areas. Of Rwanda's total territory, 12.42 percent, 3,270 km2, is either totally or partially protected. The three main conservation areas are Volcano National Park in the northwest, Akagera National Park in the east, and the Nyungwe Forest Reserve (soon to become a National Park), the largest conservation area in the country, a 970km2 tract of rainforest with unusually high biodiversity.

- National Strategy and Action Plan for the Conservation of Biodiversity. After ratifying the Biodiversity Convention, the GOR drafted a National Strategy and Action Plan for the Conservation of Biodiversity (2000). The plan analyzes the current status of biodiversity in Rwanda and the threats to biodiversity and proposes objectives, strategies, and an action plan to address the threats. The GOR has made progress toward most of its objectives, but more work needs to be done in the following areas:

    - Prioritizing a research program oriented to conservation and management of biodiversity
    - Improving institutional, juridical, political, and human resource cadres to assure better management of protected areas and wetlands
    - Improving the protection and management of critical areas outside the formal protected area system.

Priorities for Improving Environmental Management and Governance

A. Policy, Legal, and Institutional Reform

- Before basic policy decisions are made, there is an urgent need to expand consultation on land tenure to get broad input from local populations, NGOs, and others working at the grassroots.

- It is critical that REMA be established; there is clear need for an interministerial body to advise on and coordinate environmental management. REMA should also have a technical arm tasked with conducting environmental assessments.

- Longer term, the GOR may need an environmental strategy for refugee relief and other emergency activities, as well as for village settlements. The strategy should: (i) ensure that both indigenous and refugee populations are involved in making decisions for the use and management of environmental resources; (ii) integrate activities to minimize environmental impacts; (iii) identify energy resources and attempt to mitigate local environmental impacts; and (iv) monitor environmental impacts. The strategy should be part of the National Environmental Action Plan.

- Given the potential long-term and environmental risks of chemical fertilizers and pesticides, it is imperative to fully implement a pesticide risk mitigation strategy, supporting training, education, and monitoring, with comprehensive GOR regulation of the use of agricultural inputs.

- The GOR needs a strategy (and eventually policy and legislation) to address the social and environmental issues inherent in traditional extensive livestock systems.

- The GOR needs to move as quickly as possible to finalize and pass the wetlands policy and legislation completed in January 2003.

- The GOR needs to continue to create polices and implementation strategies, including leasehold criteria, for privatizing national and district forest plantations

B. Institutional Strengthening

There is a clear need to establish REMA as a way to improve coordination at the national level. There is also a need to strengthen capacity in Ministries to ensure that they consistently integrate environmental concerns in everything they do. One example is the need for ORTPN to improve cooperation among the NGOs working in PNV to improve their effectiveness, reduce costs, and better serve local communities.

Although the GOR has made some progress in decentralizing other sectors, much still needs to be done to decentralize environmental management by, e.g., (i) defining competencies and institutional mechanisms for decentralization; (ii) examining the links between land tenure and environmental management; (iii) analyzing the financial mechanisms that support decentralization; (iv) passing and implementing the national environmental law; (v) establishing provincial, district, and urban/town environmental committees; and (v) analyzing best practices for decentralized environmental management.

C. Economic Incentives

The ETOA team strongly recommends that ORTPN set up a revenue-sharing scheme for PNV and other protected areas that would return a percentage of tourism proceeds to proximity communities for investment in activities lost as a result of denied access to the forest.

D. Regulation and Enforcement

The current failure to enforce environmental regulations undermines environmental management and protection. Usually, the lack of enforcement stems from the weakness of the institutions responsible for enforcement and a lack of political will to see that the laws are enforced. Long term, capacity building programs are needed, combined with programs to raise the awareness of a wide range of stakeholders (e.g., resource users, judges, etc.) as to the interrelated nature of environment, economics, and health.

E. Environmental Education and Awareness

The GOR needs more coherent national strategies to raise public awareness of environmental and biodiversity issues, highlighting practical everyday linkages, such as those between environment and health. More effort is needed to bring in key partners, such as churches, the media, primary school teachers, and community leaders.

At the local level, targeted social marketing programs conveying environmental messages centered on Rwanda's protected areas can help fill the awareness gap and promote behavioral change.

F. Research

Key areas for GOR attention are to:

- Identify research themes leading to better land management and management and conservation of protected areas. These might include: drafting a rational, cost-effective soil conservation strategy and implementation plan for farms; a small program on succession ecology in Nyungwe to determine how the absence of ungulates affects natural regeneration; and research on the impact of Protopter spp. on the indigenous fish population of Lake Muhazi.

- Put in place a research policy that prioritizes research themes and encourages research organizations to address them.

- Create a research cadre on biodiversity to better coordinate research activities and results. The GOR should consider formalizing and strengthening NUR's Environmental Research Coordinating Unit and mandating it to draw up research policy.

- Systematize the approach to collecting and managing environmental data. Although NUR faculty and specialists at ISAR, KIST, and elsewhere have conducted numerous studies, the results are widely scattered and often inaccessible. There is a clear need for a central repository for environmental information with mechanisms to insure that the information is made available to both decision makers and the public. NUR's GIS and Remote Sensing Center would be a logical repository for data because it is already the clearing house for Rwanda's geographical databases.

Recommendations for USAID/Rwanda

Though USAID/Rwanda's current strategy is primarily concerned with environmental compliance under 22 CRF 216, the ETOA team believes that compliance alone is not enough. USAID/Rwanda needs to give more attention to the FAA Section 117 requirement that operating units implement their programs with an aim to maintaining and restoring the natural resources upon which economic growth depends. However, rather than suggesting that USAID/Rwanda rebuild a large, stand-alone biodiversity program, the assessment team has identified activities under USAID/Rwanda's proposed plan that (i) might be modified to meet significant forestry and biodiversity conservation needs and (ii) promote synergy between its SOs. Integrating biodiversity and forestry issues into the Mission's general programs is the most promising approach to establishing the essential conditions for conservation while meeting the objectives of social and economic stability.

At the program level, USAID needs to regain its seat at the environmental policy table; it must:

- Find ways to support formulating the regulations and applications that will be needed once the framework environmental law is passed; without multilateral support for this law through implementation, there are real reasons to be fearful for Rwanda's crumbling environment
- Support the establishment of REMA

- Continue to work with primary partners (ADAR, ACDI/VOCA, and PEARL) to assure that all projects addressing agribusiness development ensure that producers and processors are aware of supply chain requirements for environmental and social values
- Work more proactively to resolve major biodiversity issues like overgrazing
- Help the GOR develop environmental strategies for refugee and other emergency relief and for resettlement villages
- Help build local capacity for conducting IEEs and EIAs
- Further promote a balanced, transparent, and accountable system of governance across SOs to allow decentralized management of natural resources and private initiatives

A. Potential Linkages between the Environment and the ISP

SO1: Increased Citizen Participation in Post/Transition Governance

Environmental Review. The SO1 team maintains an environmental review process for subgrants under the International Rescue Committee's Decentralization and Good Governance Project in Kibungo. The project uses EIA guidelines mainly for construction projects (schools, health centers, markets, slaughterhouses, water supply, power supply, and road/bridge rehabilitation) but also for agricultural projects, including wetlands development.

Opportunities and Entry Points:

1. **Strengthen the IRC Decentralization and Good Governance subgrant component:** Help communities to internalize the environmental review process and environmental capacity building at the outset of activities; strengthen community-based environmental assessment skills through local organizations; use informal education methods that empower both the illiterate and the literate.

2. **Strengthen civil society organizations that promote environmental management:** A number of Rwandan NGOs are active in environmental education, community conservation, and other environmental initiatives. They can be strengthened in their work to empower communities to effectively manage natural resources. National NGOs could also be supported to become stronger advocates for environmental issues. USAID should continue to examine ways to work with international foundations that support NGOs and CBOs operating in Rwanda. Linking environmental with family planning NGOs locally in joint programs would promote synergy between SO1 and SO2.

3. **Build the environmental capacity of local governments**. A major point of entry to begin to build capacity for environmental management and protection at the level of province, district, sector, and cell would be to convert, with the support of the prefect, national and district-owned forest plantations to long-term leasehold status, to be managed by farmers associations. This activity would be linked with the SO3 economic mandate**.**

4. **Improve district land use planning.** Longer term, USAID needs to consider helping provincial and district governments prepare land use plans as a basis for long-range fiscal and programmatic planning, monitoring resource use, tax projections, and zoning.

SO2: Improved use of community health services in selected health districts

Environmental Review. The SO2 team that wrote the PERSUAP for ITNs has found that the nets are safe for household use if users are trained in their proper care.

Opportunities and Entry Points:

1. **Strengthen family planning programs in environmentally sensitive areas.** Effective family planning programs diminish the negative effects of rapid population growth on natural resources. Strong synergies are possible between this SO and natural resources conservation, especially in areas of rich biodiversity like PNV and Nyungwe. Environmental awareness could be part of an expansion of population awareness efforts under the health SO, using the same grantees and techniques but different messages.

2. **Develop a program with current partners for medical waste disposal:**

- Help MINISANTE and MINITERE put in place a national strategy for medical waste disposal, and update legislation as required
- Write environmental guidelines for waste disposal sites at health centers and ensure that the MOH incinerator design is adequate for proper incineration
- Help create a public awareness campaign on the dangers of handling medical wastes
- Train health center personnel, particularly those charged with maintenance and disposal, in medical waste disposal.

3. **Conduct a follow-up "good services survey" of users of treated mosquito nets.** Although the PERSUAP provides guidelines for use of the nets, there has been no follow-up to see if the messages (box instructions, training, etc.) are actually being effectively used by the intended audience. There appears to be need for a follow-up survey to judge impact and perhaps redesign communications messages. This could be done in conjunction with the WHO Roll Back Malaria Program.

SO3: Expand economic opportunities in rural areas

Environmental Review. The SO3 team has perhaps naturally been the most active in terms of environmental compliance activities.

- IEEs have been prepared and approved (or are pending approval) for all development assistance projects (Catholic Relief Services, World Vision, ACDI/VOCA, and World Learning)
- A PERSUAP has been prepared for Rwanda Crop Protection and Commodity Protection
- ADAR prepared a study on Environmental Management Systems for Agribusinesses in Rwanda that has examples of environmental mainstreaming and management capacity building.
- USAID plans training in 2003 for local NGOs and other organizations on IEEs and Cleaner Production through REDSO/ESA

Although not directly supported by USAID/Rwanda, the GOR is implementing a water hyacinth control program through weevil rearing and release efforts that in the past was assisted by Clean Lakes, Inc. with funding from USAID/Uganda.

Opportunities and Entry Points:

1. **Increase off-forest production and enhance the market potential of and/or adding value to Non- Timber Forest Products (NTFP) (bamboo, honey, medicinal plants).** Help local communities produce high-value NTFPs and plan supporting marketing strategies to bring in a higher percentage of the final market price, such as promoting "green" products like Nyungwe Rain Forest honey and tea.

2. **Promote forest-plantation-based small-scale private industries.** Working with farmers groups, stimulate small-scale forest industries (firewood, charcoal production, furniture making) in conjunction with the privatization of forest plantations described under SO2 above. A key element of this support would be to enhance both the technical and the business capacity of these groups.

3. **Support additional studies on biodiversity and on better integration of terracing in Rwandan farming systems.** In particular:

    - A cost/benefit cost analysis comparing terracing techniques
    - A socioeconomic analysis of the use of different terracing techniques on a single farm
    - Provide additional support to the National University of Rwanda's (NUR) Geographic Information/Remote Sensing Center for protected/critical area mapping, and for data collection and dissemination.

4. **Modify DAPS to better reflect current socioeconomic and environmental reality.** This can be done in a number of ways:

    - Encourage an integrated landscape (hillside and wetland) approach to agriculture DAPS.
    - Ensure the environmental and economic sustainability of rehabilitated wetlands by:
        - Developing/refining environmental criteria for choosing marshlands to be rehabilitated
        - Using social assessments like PRAs to identify constraints to long-term ownership and maintenance of infrastructure and designing ways to mitigate those constraints
        - Developing a simple environmental monitoring program for each DAP in allow for mid-course corrections in a project.
    - Be cautious in using FFW (monetized or other) to support on-farm activities like terracing and tree planting to avoid jeopardizing long term environmental and economic sustainability.
    - Consider using FFW (monetized or other) for public works types of activities in and around national parks and forest reserves, setting up in effect a Rwandan Civilian Conservation Corps.

- Limit USAID support to methane extraction to helping the GOR draft guidelines. Options to promote private wood fuel production and other alternatives of methane are preferable and should be pursued.

SECTION I

Background

A. USAID's Program in Rwanda

USAID/Rwanda seeks to promote prosperity and long-term peace based on openness and mutual respect between Rwandans and Americans. USAID/Rwanda's initiatives support:

- Greater citizen participation at the community, regional, and national levels
- The rule of law in protecting basic human rights and supporting commercial activities
- Greater opportunities for private agro-enterprise development
- Integration of economic development and environmental concerns
- Better health and reproductive services.

Recognizing Rwandan capability and culture post-conflict, USAID works to strengthen Rwanda institutions so that they will continue long after U.S. assistance ends. USAID seeks to build sustainable partnerships between Rwandan and American entities and supports Rwandan nongovernmental organizations (NGOs). Working in reform-minded regions, USAID coordinates its activities closely with other U.S. government agencies and international donors, complementing its use of experienced American technical specialists with local Rwandan expertise wherever possible.

USAID's programs are directed toward making Rwanda a full partner in the community of nations, thus promoting prosperity and peace. The Mission understands that past civil unrest has been at least partly due to the way natural resources are distributed and have been managed; it seeks to mitigate further conflict by advocating more efficient governance and more sustainable use of limited land resources.

USAID/Rwanda is currently drafting a five-year country integrated strategic plan (ISP: 2004-2008) that will align the Mission's proposed strategic objectives with the Government of Rwanda's (GOR) poverty reduction strategic plan (PRSP), which now guides all GOT development efforts. Aligning the USAID/Rwanda program with the PRSP will not only signal support for the GOR's poverty reduction strategy but will also enhance synergy across sectors and increase management efficiency. In this context, USAID/Rwanda recognizes that protecting the environment and managing natural resources wisely are of the essence of any successful development program. Thus, USAID contracted with Chemonics International to conduct an environmental threats and opportunities assessment (ETOA) for Rwanda.

B. Assessing Environmental Threats and Opportunities

This report reviews the environment sector in Rwanda and assesses related threats and opportunities. Such an assessment, which the USAID strategic planning process requires, will underpin USAID/Rwanda's ISP: 2004-2008. Details of the required assessment, derived from the Foreign Assistance Act (FAA), are spelled out in 201.3.4.11.b Technical Analysis for Strategic Plans, Environmental Analysis. They include:

- *Environmental Sustainability*. FAA Section 117 on "Environment and Natural Resources" dictates that operating units must implement their programs with an aim toward maintaining and restoring the natural resources upon which economic growth depends and must consider the impact of their activities on the environment. These requirements are reflected in USAID's ADS Chapter 204 "Environmental Procedures," which describes how to apply 22 CFR Part 216. This regulation codifies USAID procedures "to ensure that environmental factors and values are integrated into the USAID decision making process." Further, 22 CFR 216.5 requires that USAID operating units conduct their assistance programs in ways that are sensitive to the protection of endangered or threatened species and their critical habitats.

- *Tropical Forestry and Biological Diversity*. FAA Sections 118, "Tropical Forests," and 119, "Endangered Species," codify more specific U.S. interests in forests and biological diversity. These sections require that all USAID operating unit strategic plans include: (1) an analysis of the actions necessary to conserve the country's biological diversity and tropical forests; and (2) the extent to which current or proposed USAID actions meet those needs. Like 22 CFR 216.5 on protecting endangered species and habitats, these regulations are in place to help Missions make the best use of current scientific and social research on the environment.

To meet these requirements, this report presents a broad overview of threats facing the environment in Rwanda based on available data and interviews with expert informants both within and outside the Mission. Although we assess the relative severity of the threats facing each sector, these need not necessarily dictate USAID environmental priorities and assistance strategies. The opportunities section may be useful to a broad range of parties that might have an interest in addressing environmental threats in Rwanda.

USAID/Rwanda has also been provided with a short ISP environmental annex that summarizes and synthesizes the findings and recommendations of the full ETOA. The environmental annex assesses the extent to which the Mission's strategy addresses tropical forests and biodiversity concerns. The complete report, "Rwanda Environmental Threats and Opportunities," will be available upon request from the master Mission ISP files.

The report also contains the following annexes:
- Annex A: FAA Sections 117, 118, and 119
- Annex B: The USAID Scope of Work for the project
- Annex C: Persons interviewed and institutions visited
- Annex D: Bibliography
- Annex E: The USAID guidelines on the use of family planning/reproductive health funds in environmentally threatened regions
- Annex F: The Redbook of Endangered Species in Rwanda published by the International Union for Conservation and Nature (IUCN)

SECTION II

Purpose and Approach

The purpose of this analysis of the environment and natural resources in Rwanda was to deliver to USAID/Rwanda a countrywide ETOA to inform USAID/Rwanda strategic planning. The specific objectives are to:

- Document the state of key natural resources by quantifying trends in their management, biophysical condition, productivity, abundance, and distribution and by identifying threats like degradation, depletion, or pollution to which they are subjected
- Analyze how past events and current initiatives (both Rwandan and donor) have shaped the country's development trajectory
- Review current and proposed GOR policies, laws, institutions, and initiatives related to the environment/natural resource sector
- Identify and analyze gaps in the existing knowledge base, whether they are within or outside the purview of existing agencies
- Review proposed USAID/Rwanda strategy components with particular emphasis on strategic objective (SO) 3, "Expanded Economic Opportunities in Rural Areas," to identify or reinforce the importance of environmental threats and opportunities relevant to the Mission's SO programs and their implications under FAA Section 117, 118, and 119 constraints
- Evaluate Rwanda's tropical forest and biodiversity resources and the extent to which the current and proposed ISPs respond to FAA sections 118, "Tropical Forests," and 119, "Endangered Species"
- Identify opportunities and entry points for USAID/Rwanda efforts that will positively influence the conservation of tropical forests and biodiversity and improve environmental management

A Chemonics team consisting of a senior expatriate natural resource and environmental management specialist, James R. Seyler, and a Rwandan environmental policy analyst, Jean Marie Mugemana, conducted the analysis, with administrative and logistical support from the Chemonics ADAR (Agribusiness Development Assistance in Rwanda) office.

The 3.5-week project began with consultations and a scoping exercise with USAID's Africa Bureau and environmental staff from the USAID Economic Growth, Agriculture and Trade group (EGAT/ENV) in Washington, D.C. and meetings with U.S.-based conservation NGOs

working in Rwanda, including the Wildlife Conservation Society (WCS) and the African Wildlife Federation (AWF).

On arrival in Rwanda, the team met with all USAID SO team leaders and assistants to review the scope of work, clarify expectations, review the status and direction of USAID/Rwanda's current and future ISP/SOs, and review the contacts list prepared by the Mission. During the first week Dr. Seyler also submitted a draft report outline and work schedule to the Cognizant Technical Officer (CTO) for comment. After an intensive period of interviews and document review in Kigali, the team traveled to field sites in seven provinces to review environmental threats, issues, and opportunities in the context of the scoping exercise, consult with USAID/Rwanda staff, Rwandan government officials, researchers, and contacts made by the Chemonics team.

Although no one from USAID/Rwanda was able to accompany the team for field visits or interviews, the CTO and SO team leaders were briefed orally during the second and third week of the analysis (during the third week the USAID Mission Director was to be briefed but the meeting had to be cancelled due to the Director's other commitments). A draft report was submitted to the Mission before the team leader left Rwanda.

SECTION III

The Rwandan Context

A. Biophysical

Rwanda is a small, mountainous, landlocked country with an area of 26,328 km^2. It is bordered on the north by Uganda, on the south by Burundi, on the east by Tanzania, and on the west by the Democratic Republic of the Congo. Its varied territory has an average altitude of 1,250m above mean sea level. Rwanda has been described as the country of a thousand hills (*mille collines*) because of its numerous hills, sometimes with flat peaks and convex slopes, separated by deep valleys measuring between 50m to 100m whose bottoms are covered with alluvium. The four dominant types of topography are plateaus and basins, hills, mountains, and plains. These influence the country's climate and in turn its socioeconomic activities.

The climate of Rwanda is of the temperate equatorial type with an average temperature range of 16-17° C and annual rainfall between 700-1400 mm, distributed in two seasons. The characteristics of the climate are linked with the geomorphology of the country's natural regions. Exhibit 3.1 summarizes the climates of Rwanda's three natural regions.

Exhibit 3.1: Climates of the Natural Regions of Rwanda

Parameters	High Altitude (1,800-3,000m)	Central Plateau (1,500-1,800m)	Eastern Plateau and Western Lands (900-1,400m)
Rainfall (mm)	1,300-2,000	1,200-1,400	700-1,400
Temperature (0C)	16-17	18-21	20-24
Evapotranspiration (mm)	1,000-1,300	1,300-1,400	1,400-1,700
Relative humidity (percent)	80-95	70-80	50-70
Insolation (hrs/day)	5-6	5-6	6-6.5
Wind (km/hr)	7-8	6-7	4-6

The highly varied soils of Rwanda include peat, clay, loam, and sandy soils. On the hillsides, they are comprised mainly of loam soils; the valleys are characterized by clay, with high organic matter content and peat in some locations. The soil generally has low fertility potential and on steep slopes the soils have been degraded by erosion.

Rwanda's hydrology is characterized by a dense network of lakes, rivers, and wetlands. Approximately 10 percent of the entire country (210,000 ha) is under water: lakes occupy about 128,000 ha, rivers about 7,260 ha, and water in wetlands and valleys accounts for about 77,000 ha.

The country has two major drainage basins, the Nile to the east and the Congo to the west. The Congo River basin, which covers 33 percent of Rwanda, receives 10 percent of all national waters. The Nile River Basin, which covers 67 percent of Rwanda, receives 90 percent of the national waters. The Nyungwe Forest is Rwanda's major watershed for both the Nile and the Congo basins. The waters of the Nile basin flow out through the Akagera river system, which contributes between 8 and 10 percent to the Nile drainage system.

Wetlands (large permanent swamps) and marshlands (seasonal grass swamps: *marais*) occupy about 10 percent of the country and comprise three large and numerous small *marais* interspersed among the country's many hills. The main swamps are Akanyaru (12,546 ha), on the border with Burundi; Kagera, along the Tanzania border to the east (12,227 ha); and the Nyabarongo (24,698 ha) and Rugezi wetlands (6294 ha) to the north. Rwanda's wetlands are important as buffers in flood or overflow plains. They reduce maximal flow rates during the rainy season and maintain a relatively high flow rate during the dry season.

Rwanda contains a wide variety of different habitats and species due in part to its varied topography, which is responsible for diverse regional climatic conditions; yet despite this rich biodiversity, endemism is thought to be low. Vegetation can best be described as a regional mosaic that includes segments of Guineo-Congolian and Sudanian vegetation. The Lake Victoria biome is subdivided into secondary grass mosaics and east African bushland, which is in turn divided into shrub savannah with trees under 4 meters high and acacia-wooded savannah with taller trees. Secondary forest mosaics produced by human activity have replaced natural vegetation in several part of Rwanda.

Savannahs, which occur mainly in the east, comprise five distinct natural zones: Mutara, Buganza, Mubari-Migogo, Gisaka, and Bugesera. These are dominated by xerophyllous vegetation in which *Acacia senegal*, *Albizia petersiana*, and *Lannea humilis* are dominant. The Mutara consists largely of open savannahs in which *Themeda spp*., *Hyparrhenia spp*. and *Cymbopogon spp*. predominate. The Buganza subregion is an undulating plateau covered by *Combretum spp*. and *Acacia siberiana*. The Gisaka region is wetter than the other zones; vegetation there consists of a mosaic of mesopyhllus forest and woodland savannahs. Bugesera subregion is in the southeast of Rwanda, where the vegetation is dominated by woodland and shrubbery savannah consisting mainly of *Acacia spp* and *Combretum spp*.

According to the Food and Agriculture Organization (FAO), in 1990 natural forests covered 164,000 ha in Rwanda, while plantation forests and other wooded land covered 946,000 ha. There are three main afromontane forest reserves in Rwanda — Nyungwe, Gishwati, and Mukura — and one national park, Volcano National Park (*Parc des Volcans*). The forests are characterized by high altitudes (2,000 m on average, though varying from 1,600 m to 4,500 m) and the dense understorey and clearings typical of afromontane forests.

The total area under forest cover, including natural forests (primarily afromontane) and plantations, fell from 660,125 ha in 1960 to 382,660 in 1996 — a reduction of about 57 percent of the original forest cover. The GOR's need to permanently resettle the millions of returnees since the 1994 war and to provide people with fuel, land, and shelter led to the almost total

destruction of Gishwati and Mukura forest reserves, Although recent data are not available, this downward trend in afromontane forest cover is thought to be continuing.

B. Socioeconomic

Rwanda has a population of about 8.16 million people, growing at the rate of about 3.0 percent annually, and an average population density of about 317 people per km^2, one of the highest in Africa. This population pressure, regardless of its distribution, combined with (1) the need to resettle returnees under the Arusha Convention and (2) an agricultural policy that promotes drainage of wetlands for increased food production, has placed enormous pressure on Rwanda's natural resources and its biodiversity (see Section 8 below).

More than 60 percent of the population lives below the poverty line and cannot meet their basic human needs. Preliminary census data released in December 2002 reported that 16.7 percent of Rwandans live in urban areas — a significant increase in urbanization since 1991. While the gender difference nationally is 52 percent female and 48 percent male, in Kigali City the split is 45 percent female and 55 percent male. Rural exodus is clearly having a greater effect on males. This suggests the urgent need for viable economic activities that will increase the earning power and improve the living standards of the rural population — a need that is even more critical with the expected demobilization of thousands of Rwanda soldiers and excombatants and the release of prisoners as a result of the Gacaca genocide trials.

The 2002 census data also reveal that almost half the Rwandan population (48.6 percent) is under the age of 16. The youthfulness of the population combined with its high population growth rate and density has had a significant impact on the use of natural resources, the environment, and all public services from health care to education.

Agriculture is the mainstay of the Rwandan economy. Approximately 91 percent of the population depends on the sector, which is also estimated to contribute about 40 percent to gross domestic product (GDP) and 30 percent to export earnings. Arable land covers about 1,385,000 ha, about 52 percent of the total area. Per capita land holdings are very small, averaging only about 0.6 ha per family. The main food starch crops are bananas, beans, sorghum, sweet potatoes, Irish potatoes, cassava, maize, and rice. The main vegetables are tomatoes, cabbages, and peas. Crop yields are generally low; though the Ministry of Finance reported that crop yields grew by 16.6 percent in the first nine months of 2002, the increase was due to good weather conditions rather than gains in productivity.

Generally, farmers are organized in community associations or cooperatives that coordinate farming activities. Both men and women are members but, as a result of the civil unrest of the 1994, the associated genocide, and the rural exodus to the cities, there are often more women than men, which has implications for labor availability and social organization.

In general, health has severely deteriorated because of the genocide, which brought a rise in child mortality; today almost one child in five (19.6 percent) dies before the age of 5. The fertility rate of 5.8 for women between 15 and 49 has dropped slightly since the early 1990s. Only 4 percent of women are using a modern family planning method, although Democratic and Health Survey data indicate that they would like to stop having children or to wait at least two years between

births. The prevalence of HIV/AIDS is estimated at 8.9 percent nationally and may be holding firm or falling. The HIV prevalence among pregnant women in Kigali City is 13.7 percent while rates in rural areas range from just 1.1 to 5.2 percent.

The greatest cause of morbidity (illness) is malaria, followed by diarrhea and respiratory infections. Both malaria and diarrhea are water-related diseases that are exacerbated by modification of marshlands and prolonged periods of interaction between people and marshlands. The causes of ill health are highly complex; among them are low incomes, limited information about preventive methods, low levels of literacy and education, and inadequate access to clean water and health services. The utilization of health services, already very low, has fallen in recent years. The main deterrent is cost, followed by poor quality. Because of the high infant and child mortality rate (107 per 1000 live births) due to malnutrition, malaria and other water-related diseases, high fertility, and HIV infection, the average life expectancy in Rwanda has dropped to 40.

As for education, 47.8 percent of women and 58.1 percent of men are literate, though gender differences are narrower at primary and secondary school levels. However, there are greater disparities between income and age groups. Only 7.1 percent of the population has any post-primary education, and only 0.4 percent has tertiary education. True, enrollment in general has been increasing — most people have access to primary education for their children — but access to post-elementary education is much more limited, particularly for the poor. Moreover, there are concerns about the quality of education, particularly given the lack of books and facilities and the challenges posed by the introduction of English and French throughout primary education without the necessary resources.

Collecting water imposes burdens on the time of women and girls due to the distances involved, and the water itself often affects health because its quality is poor. In rural areas, access to safe water may have declined to around 44 percent. In urban areas, Electrogaz provides drinking water to about 60 percent of the population.

Population movement has also seriously affected the quality of life for Rwandans. Almost 3.5 million of them have been displaced or have only recently returned. There is still a huge need for wood for housing construction because many people are still homeless, and 98% of all households in Rwanda still rely on wood or charcoal for cooking.

C. The Political and Legal Context

Rwanda follows the Transitional Fundamental Law, made up of:

1. The National Constitution of 10 June 1991
2. The Arusha Peace Accord of 4 August 1993
3. RPF Declaration of 17 July 1994 establishing the state institutions
4. The Protocol of Accord between eight political parties agreeing on the establishment of national institutions, signed on 24 November 1994.

The Fundamental Law defines three branches of government: executive, legislative, and judiciary, though the Transitional Period defines four categories; the presidency, the transitional government, the transitional National Assembly, and the institutions of the judiciary power.

C.1 The Executive Branch

The president of the republic, in collaboration with the government, controls the executive branch and has the following powers:

- Approves and publishes laws passed by the National Assembly and decrees of the Cabinet
- Appoints the Prime Minister and other Ministers
- Issues presidential orders on clemency, money minting, national decorations, and the ratification of treaties, conventions, and international accords
- Appoints and dismisses high officials, such as the Director of the presidential Cabinet, the Governor of the National Bank of Rwanda, the Rector of the National University of Rwanda, ambassadors, government secretary generals, and the General Prosecutor of the Supreme Court

C.2 The Government

The government is made of the Prime Minister, ministers, and state ministers. The government is mandated to:

- Manage the country
- Execute laws and regulations
- Negotiate and conclude treaties, conventions, and other international accords
- Draft and approve laws for emergencies
- Appoint and terminate contracts for civil servants
- Review and approve presidential orders
- Promote peace and national unity
- Organize institutions for defense and security
- Repatriate and reintegrate Rwandan refugees into the population and promote the national economy
- Prepare the national budget

C.3 The Prime Minister

The Prime Minister is the head of the government according to the Fundamental Law. The Prime Minister, in consultation with the political parties represented in government**,** draws up the government program and submits it to the National Assembly and to the Ministers concerned with its execution, chooses the members of the government, calls and chairs the Ministers' Cabinet, and determines the portfolio attributions of ministries and state ministries.

In consultation with other political parties represented in the government, the Prime Minister proposes candidates to head the different ministries and appoints many other high civil servants,

such as the Vice-governor of the National Bank of Rwanda, the Vice-rectors of the National University of Rwanda, prefects, and mayors.

C.4 The Cabinet

The President, in consultation with the Prime Minister, appoints members of the Cabinet according to political allegiance. A member of the Cabinet cannot be at the same time a Member of Parliament. Cabinet decisions are made by consensus.

C.5 The Legislative Branch

The legislative power is exercised by Members of Parliament (the Transitional National Assembly) nominated by their political parties. The powers of the Transitional National Assembly are the following:

- Pass legislation
- Decide on accusations against the President of the Republic
- Interpret the Arusha Peace Accords
- Vote on the national budget

SECTION IV

Constitutional and Policy Framenwork for Environmental Management

A. Constitutional Framework

The current constitution does not address environmental issues. The constitution now being drafted takes into consideration the environment as a whole and how people relate with it. Proposed Article 48 states:

> Every citizen has a right to a safe, satisfying, and sustainable environment. Every person has the duty of protecting, maintaining, and promoting the environment. Any act aiming at damaging the environment is punishable by law. The state must protect the environment.

Proposed article 192 prohibits any agreements authorizing the storing on Rwandan territory of toxic waste and other substances that may dangerously damage the environment. It states:

> Accords on installation of military barracks on the national territory and those authorizing the storage of toxic waste and other substance that are dangerous for the environment are prohibited.

The new constitution, which will be presented for a referendum in May/June 2003, ensures the protection and sustainable management of the Rwandan environment more than any other constitution has ever done before. When adopted, it will provide the basis for protection and rational use of Rwanda's environmental resources.

B. The National and Local Government Environmental Policy Framework

B.1 The National Policy Framework for Environmental Management

Rwanda's policy framework for environmental management is grounded in four key documents: the National Environmental Strategy, the Poverty Reduction Strategy, Vision 2020, and the National Environmental Policy (in draft), which are reviewed below. The ETOA team believes that together these documents constitute a solid basis for sound environmental management in Rwanda but has two concerns:

- There is considerable redundancy and there are also gaps. The final version of the environmental policy should harmonize elements of the Vision 2020 and the poverty reduction strategies into a definitive policy document on the environment in Rwanda.

- Any policy is only as good as the degree to which it can be implemented. Though considerable thought has gone into drafting environmental policy statements, more

attention must be given to implementation mechanisms, including economic incentives and disincentives and stricter enforcement.

B.1.1 Historical Perspective

Initiatives on environmental conservation and protection began in 1920 under colonial administration with large-scale tree planting, followed by creation of Volcano National Park in 1925 and Akagera National Park in 1935. Campaigns to conserve soil through terracing began in 1949 but were abandoned immediately after independence due to the negative connotations associated with the use of forced labor to build the terraces.

In 1975, National Tree Day was institutionalized and in later years the GOR set annual environmental themes: habitat (1977), animal husbandry (1978), soil protection and conservation (1980), rural water supply (1981), anti-erosion (1982), tree planting (1983), and rehabilitation of war-damaged areas (1992).

In April 1992, the Ministry on Environment and Tourism (MET) was created to coordinate all the environmental activities being carried out by different ministerial departments.

Rwanda's first National Environmental Strategy and Action Plan were approved on May 21, 1991. This document guided the MET until the tragic events of 1994, which affected the course of all programs in Rwanda, not just environment.

B.1.2 The Current National Environmental Strategy

In light of the changes that followed the 1994 war and genocide, the National Environmental Strategy was amended in June 1996. The revised strategy enumerates the principles and priorities of environmental management, notably:

- Alleviating poverty, food insecurity, and the energy crisis
- Planning development in light of the characteristics and potential of the ecosystems concerned
- Minimizing deforestation and promoting biodiversity
- Dealing with the question of the future of the wetlands
- Managing ecological, biological, and climatic changes at the national level
- Managing the urban environment and controlling pollution

The immediate objectives of this strategy are to:

- Stop the degradation of lands and forests and enhance their regeneration through a sustainable, balanced ecological approach
- Fight against urban and other pollution and eliminate sources of illnesses caused by the environment
- Maintain sufficient resources to insure the food security of the population in both the short and the long term
- Regenerate, renew, and diversify domestic sources of energy

To reach these objectives, this strategy is guided by the following principles:

- The importance of the environment as a whole
- The importance of taking into account the human and social environment
- The necessity of both a long-term vision and a proactive approach
- The obligation to establish practical priorities

Given these, the strategy has the following objectives:

- Assign responsibilities, mobilizing all partners
- Integrate environmental concerns into all decisions, particularly those related to resources and land
- Manage natural resources and land sustainably
- Restore and maintain a safe environment
- Promote environmental knowledge in general, with special attention to how it affects both people and nature, emphasizing the ecological, cultural, and economic roles of the environment
- Use environmental management approaches adapted to the particularities of different regions of Rwanda.

B.1.3 Rwanda's Poverty Reduction Strategy

The strategy for poverty reduction in Rwanda also addresses environmental concerns through its six priorities for public action:

1. *Rural development and agricultural transformation*. Activities that directly affect the capacity of the poor to increase their incomes, those that affect agriculture and environment, land, nonagricultural development, loans, rural energy, and rural infrastructure, and rural public works that are highly labor-intensive.

2. *Human development*. Activities that influence the quality of life of the poor in such areas as health, family planning, education, water, and habitat. Habitat is particularly important because it is so closely related with water provision.

3. *Economic infrastructure*. Roads, energy, and communication to support economic development in both urban and rural areas.

4. *Governance*. Security, constitutional reforms, judicial systems, decentralization, departmental strategies, responsibility and transparency, and public service reform.

5. *Private sector development*. Promoting investment, reducing costs and business risks, and promoting exports.

6. *Institutional capacity building*. A priority that affects all sectors to which the concept of institutional structure applies and that promotes competitiveness in both public and private sectors.

The strategy goes on to define fundamental programs for reducing poverty and protecting the environment as part of the first domain of priorities for agricultural transformation. In particular, the first fundamental program promotes support to agriculture and animal husbandry and related environmental protection activities. In this program, intensive agricultural and environmental activities must be carried out together in order to manage water resources, control soil erosion, and improve soil fertility.

B.1.4 Vision 2020

In Rwanda's Vision 2020, environment is among the priorities; it addresses sustainable management of national holdings, the environment, and such natural resources as soils, water, energy, and biodiversity. For managing and protecting natural resources and the environment, Rwanda plans to reach the following goals by 2020:

- Reduce the percentage of the population dependent on agriculture from 90 to 50 percent
- Increase and update environmental protections adapted to sustainable management of natural resources
- Reduce by up to 60 percent the rate of morbidity related to environmental degradation
- Decrease the number of fuelwood users from 50 to 24 percent.

To reach this objective, Vision 2020 states that Rwanda has to:

- Integrate an environmental aspect into all official policies and decision-making processes, and into all education, public awareness, extension, and development programs
- Promote participation by members of local communities, especially women and youth, in environmental protection and management
- Use the principle of prevention to alleviate negative environmental effects of socioeconomic activities
- Diversify energy sources and make them more accessible to the population to alleviate the pressure on biomass
- Establish the principle that "polluter pays" for environmental damage, and strengthen punitive measures to insure compliance and environmental safety
- Assess the environmental impact of any proposed project or development program
- Plan for the development of industrial sites to better control their effects on the environment and the population
- Promote nonpolluting technologies for transport, storage, and elimination of industrial products and waste
- Apply environment-related legislation to mining and mineral debris
- Rehabilitate old mining areas

- Reinforce the institutions concerned with local and imported product quality control and standards
- Build a statistical database on natural resources and the environment and a quick alert system to help mitigate natural disasters, and create a fund to support victims of natural disasters
- Institute and appropriately fund the Rwanda Environmental Management Authority (REMA)
- Cooperate with other nations and international institutions for environmental protection
- Ensure that public institutions, the private sector, civil society, donors, and local communities collaborate to more efficiently manage natural resources and protect the environment.

B.1.5 The National Environmental Policy

The Rwandan national environmental policy that has been in the works since 2000 is now being finalized

Chapters 1 through 4 of the draft policy set the scene. They sketch in the history of environmental policy in Rwanda and outline environmental protection and conservation in such key sectors as soils, climate, vegetation, natural resources, protected areas, energy and water resources, land, and demography. The principal current threats to the Rwandan environment are also analyzed and key terms (e.g., environment, biotope, waste, natural resources, and sustainable development) are defined.

B.1.5.a Policy Objectives

Chapter 5 outlines the objectives and principles of Rwanda's national environmental policy. The major objectives are to improve the standard of living and the sustainable use of natural resources and to protect and manage natural areas for balanced and sustainable development. The specific objectives of the environmental policy are to:

- Improve the health of the Rwandan people and promote their socioeconomic development through the sustainable management and utilization of natural resources and the environment
- Integrate environmental aspects into all policies, planning, and implementation activities carried out at the national, provincial, and local levels with total participation of the population
- Conserve and restore ecosystems and maintain dynamic ecology and systems health, especially national biological diversity
- Optimize sustainable use of natural resources
- Sensitize the population to environmental values and the relationships between the environment and development
- Insure the participation of both individuals and communities in activities aimed at improving the environment, with particular attention to women and young people

- Insure that the basic needs of Rwandans today and those of future generations are satisfied

B.1.5.b Underlying Principles

The principles on which the policy is based are that

- Each person is entitled to live in a safe environment and has a duty to maintain the environmental welfare of all.
- The economic development of Rwanda must be based on sustainable use of natural resources.
- The right to the land is a priority for sustainable management of natural resources..
- Long-term food security depends on sustainable management of natural resources and the environment.
- Use of nonrenewable resources must be minimized and recycling used where possible.
- Technologies that are socially accepted and accessible must be disseminated if natural resources are to be used efficiently.
- The costs of environmental damage and degradation must be taken into consideration in planning for public and private investments and must be minimized wherever possible.
- Socioeconomic incentives and disincentives must go hand in hand with legislative measures to convince the people to invest in a sustainable environment.
- Legislation to promote capacity building must be a priority if natural resources and the environment are to be managed sustainably.
- Activities that favor incentives for the rational use and sustainable management of natural resources and environment must be given priority.
- Planning for environmental management must be integrated and multisectoral.
- A system must be created for environmental monitoring and evaluation and information obtained through this system must be disseminated to the public.
- Opportunities for communities and individuals to sustainably manage their resources must be facilitated.
- Women and young people must be encouraged to become active in formulating policy, planning programs, making decisions, and managing programs.
- Both government and public awareness and understanding of environmental issues must be promoted.

B.1.5.c Political Options and Strategic Actions

Chapter 6 addresses political options and strategic actions for various sectors, among them:

- Population and territory management
- Land management
- Water resources management
- Valleys
- Agriculture

- Animal husbandry
- Fishing
- Forests and protected areas
- Energy
- Gender and environment
- Transport and communication
- Mines
- Industry and commerce
- Sanitation and health
- Education, information, and research
- Climate and natural catastrophes
- Macroeconomics
- The institutional and judicial domain
- International cooperation

B.1.5.d Institutional and Judicial Arrangements

Chapter 7 proposes institutional and judicial arrangements for implementing the environmental policy. This chapter proposes the creation of:

- The National Environmental Council, as a political instrument for coordination
- The Environmental Authority, as an implementing instrument
- The Environmental Fund
- The Environmental Tribunal, as an instrument of conflict resolution
- Environmental Provincial and District Committees

B.2 Local Government: The National Policy of Decentralization

The National Policy of Decentralization adopted in May 2000 is based on the following principles:

- *Insure national unity, indivisibility, and balanced development*. This principle is designed to avoid use of decentralization policy as an excuse to foster national disintegration and discriminatory development.

- *Insure autonomy and local identity, interests, and diversity*. This principle encourages people to participate in identifying needs and local interests when plans are prepared so as to satisfy and mobilize the resources and energy required for executing the plans.

- *Separate political from administrative and technical authority*. By clearly defining roles and responsibilities, this principle aims to help avoid conflicts of interest and concentration of powers.

- *Harmonize responsibilities with the transfer of financial, human, and material resources*. Harmonizing the responsibilities and functions transferred with the human, financial, and material resources transferred will make the decentralization policy meaningful by rendering local communities answerable to their own planning initiatives, and the activities of managers answerable to their developmental plans.

The GOR's National Policy of Decentralization aims at rendering the Rwandan people responsible for management and utilization of resources, including natural resources and the environment. The policy requires that all objectives and duties be undertaken with respect for the environment. In fact, the purpose of principle (iii) of this policy is explicitly to:

> Reinforce the awareness of the local environment as well as the capacity of the public administration to intervene to address environmental issues by availing itself of the planning, finances, management and control of activities where these services are provided and by making local leaders capable of developing structures and organizational capacities that take into consideration the environment and local needs.

Like the national environmental policy, the policy framework is adequate for decentralized environmental management. Responsibilities of for environmental management are well defined; the policy clearly states that the district is in charge of water resources, tourism, and environmental protection. Responsibilities for urban entities such as cities, towns and municipalities are also defined; they include territory management, urban planning, road construction, water provision, sanitation, waste treatment and disposal, maintenance of green spaces, and environmental protection and management. (The policy is not as refined as it is in Uganda, where environmental officers have actually been assigned to the districts to ensure both compliance and program implementation.)

Here, the ETOA team is again concerned about how policies will be implemented. In particular:

- The "necessary human, financial and material resources" have not been transferred, at least for the environmental sector. In the provinces, districts, and sectors local capacity to address environment/natural resource issues is very limited — as are financial and material resources.

- Separating political from administrative and technical authority also appears to be problematic. A case in point is the conflict about the disposition of a district woodlot between the district mayor and the head of the district council. From our discussions with a number of people, it appears that this type of conflict is not ncommon. Although both officials are elected, the former is more political and had considerably more power before decentralization.

Finally, it should be noted that the draft national environmental policy and legislation call for provincial, district, and urban environmental committees to be established. The major responsibility of these committees will be to help protect and manage the environment and encourage the direct and active involvement of the population in environmental activities.

SECTION V

Legislative Framework

A. Current National Framework

Because the environmental sector is a relatively new addition to the political framework of Rwanda, few laws concern the environment specifically. Nevertheless, there are long-standing laws that regulate natural resources and several more are being drafted. A complete analysis of the effectiveness of the laws, both passed and proposed, is beyond the scope of this report, although later in this report there are some brief comments, particularly on laws that relate to USAID programs. Nevertheless it is possible to make the following general observations about environmental legislation in Rwanda:

- Although Rwanda has many environmental laws on the books, their enforcement is at best minimal, which undermines environmental management and protection. Usually, the lack of enforcement is a result of the fact that the institutions responsible for enforcement are weak. However, changing the enforcement picture in Rwanda will take more than just capacity building; it will require building the political will to see that regulations are enforced. Such changes are long term; first it is necessary to raise the awareness of a wide range of stakeholders (e.g., resource users, judges, etc.) about how the environment, the economy, and public health are interrelated.

- Perhaps related to the enforcement problem is the fact that drafting and passing legislation in Rwanda can take years. For one thing, most legislation incorporates a considerable amount of detail; in addition there is the desire to obtain fairly broad-based agreement on these details. In fact, all this detail may not be warranted given the enforcement limitations; in other words (as with policy), a good law is one that can be enforced. The ETOA team considers it better to have a good environmental policy framework and a few pieces of critical legislation that are enforceable rather than a multitude of laws that however appropriate may be impossible to enforce due to capacity constraints or lack of political will.

With these points in mind current and pending legislation related to the environment is summarized below.

A.1 Forest Legislation

A.1.1 Existing Legislation

Law N° 47/1988 announced on December 5, 1988 was officially published on February 1, 1989. This law covers soil protection, conservation, and restoration, which could play an important role in watershed protection, particularly where reforestation is required. Article 4.2 specifies the contents of communal forest plans and requires an inventory of communal lands threatened by erosion or degradation that may require reforestation as a means of conservation and restoration. Unfortunately, because this inventory has never been done, this provision does not play the role

envisioned for it in protecting watersheds. Article 28 stipulates that national parks, the banks of lakes and streams, and marshes with woody vegetation belong to the national forest estate, but has no implementing regulations to identify how it might be applied.

The decree of 18 December 1993 requires that prior authorization from the Forestry Department before wood is cut and sold. The decree specifies sanctions for offenders and taxes to be paid before a cutting and selling permit is issued.

A.1.2 Draft Legislation

The Ministry of Agriculture and Livestock (MINAGRI) is drafting an Arrêté Ministeriel that would provide 30-year leases for groups and private individuals to manage state forests if they can demonstrate capacity to do so. This Arrêté has significant implications for improved management of Rwanda's severely degraded state woodlots.

A.2 Laws on Fishing and Aquiculture

A.2.1 Existing Legislation

The laws now in force exist are from the colonial period and mainly regulate fishing and the introduction of new fish species; one law bans importation of water hyacinth. Specifically,

- Ordinance n° 325/Agri (1947) prohibits introduction of exotic fish species into bodies of water in Rwanda.
- Ordinance n° 51/162 (1955) prohibits retention, culture, multiplication, sale, and transportation of the Eichornia crassipes, the water hyacinth.
- O.R.U. n° 52/55 (1955) prohibits using narcotics to catch fish in the lakes and rivers of Rwanda.
- O.R.U. n° 52/160 (1955) states that in all the lakes of Rwanda, it is prohibited to fish with nets with a mesh less than 4 cm in size of with nets of more than 1 km long. It is also prohibited to lay a dormant net less than 50 m from the bank.
- O.R.U. n° 552/97 (1959) prohibits fishing with seines in the interior lakes of Rwanda except in Lake Kivu, although fishing with seines may be authorized for research purposes.
- In Circular n° 1900/07024 (1997) MINAGRI regulates fishing as follows:
  - Before fishing every person or every association must have a license issued by the Director of Regional Agricultural Services for that area.
  - This license is valid for one year; it is bought by paying 2000 FFW to the public revenue authority.
  - Every boat used in fishing must be registered and easily identified;
  - No fishing nets may be used with meshes less than 4 cm in size.
  - No dormant nets mayu be laid less than 25 m from the bank.
  - No fish may be caught by beating or by using narcotics or nets whose dimensions are prohibited.

A.2.2 Draft Legislation

A law on fishing and aquiculture awaits adoption by the authorities, but the details are unavailable. The team was unable to locate legislation or an Arrêté that permits private fishing concessions on Rwanda's lakes (see Section 8.1.1).

A.3 Water Resource Management Legislation

A.3.1 Existing Legislation

Several ministries have responsibility for managing water resources, depending on how it is used, among them the Ministry of Water, the Ministry of Energy and Natural Resources (MINERENA) (hydroelectricity, food, and potable water), MINAGRI (irrigation and drainage for agriculture, aquaculture, and fishing), and the Ministry of Land, Human Resettlement, and Environmental Protection (MINITERE) (environmental management). There is no law regulating management of water resources except one dating from January 7, 1974 on pollution and the contamination of springs, lakes, and rivers. This ordinance requires the territorial authority to determine the zones of protection of lakes, rivers, or parts of rivers used as, or having the potential to be used as, potable water sources. MINERENA is drafting a new law. The one additional law that applies in this area is :

- Ordinance n°221/116 (1958) recommends that administrators take measures to ensure proper protection, salubrity, tranquility, and public order on lakes and rivers.

A.3.2 Draft Legislation

The Ministry of Public Works issued a draft law on sanitation in February 1997; it would regulate used water generally, collection and evacuation of rainwater, treatment of solid wastes, and atmospheric pollution, among other areas. The ETOA team was unable to determine the current status of this law.

A.4 Land Resources Legislation

A.4.1 Existing Legislation

Land resources are governed by Law n° 11/82 (1982) on protection, conservation and utilization of lands. Under this law every farmer must:

- Create and maintain mechanisms to prevent land or wind erosion and avoid all related degradation.
- Maintain and improve the fertility of the land
- Practice farming methods that do not degrade lands.
- Avoid overstocking and degradation of pastures
- Obey any other laws issued to protect, conserve, and utilize land resources.

In all activities related to the creation and maintenance of roads, the person in charge should:

- Avoid cause damage to neighboring land.
- Plan for anti-erosion schemes, such as planting grass on slopes and trees to prevent land slides.
- Ensure proper drainage of rainwater to prevent gully erosion.

In all mining or quarry concessions, the concession holder should:

- Establish and maintain dispositions against erosion
- Bank up or plant trees on lands damaged by the concession
- Avoid damaging farming or other lands through the accumulation of scrap and tailings or polluted waters.

Lands where agriculture and animal husbandry are deemed impossible should be planted with trees. Natural forests should only be cut in conformity with the law.

Setting fire to bush, grass, or any other vegetation, living or dead, is forbidden.

A.4.2 Draft Legislation

No legislation in process is known to the ETOA team.

A.5 Physical Planning and Urban Administration

A.5.1 Existing Legislation

During the colonial period, physical planning and urban administration were regulated by the Decree of June 20, 1957 on Rwanda-Urundi urban administration. Just after independence, Presidential Order N° 14/03 issued on March 15, 1963 established a commission in charge of urban administration. This decree and order were modified and completed by Decree-law n° 04/81 (1981) on physical planning and urban administration and its modification in 1990 law that for better urban administration called for urban master plans which must:

- Define the principles of habitat
- Establish a public investment program
- Coordinate administrative action

Urban master plans must include:

- A presentation report
- A description of the current state
- A plan of priority first-phase operations
- A plan for investments and public action.

This law created two institutions to conduct urban administration and physical planning: the National Commission of Urban Administration and Physical Planning, whose main duties are to

propose, consult, and harmonize operations; and a technical committee whose duty is to prepare working documents for the commission.

Master plans for cities and towns are temporarily accepted by the commission, approved by the Minister of Public Works, and then adopted and sanctioned by the 1990 decree.

Since 1994, the GOR has had to adapt its physical planning and habitat policy and the supporting legislation to current reality — a reality dominated by the urgent need for permanent resettlement of repatriated and displaced populations. The Arusha Peace Accord in the Protocol of Repatriation of Refugees and Reinstallation of Displaced Persons takes into consideration the environmental dimension. Article 3 states:

> For . . . repatriated persons, the Government of Rwanda will make available non-occupied lands by particulars, after identification by a Commission which will be in charge of the repatriation. The Commission will have the role of prospecting and selecting sites of installation without restriction . . . . The choice of sites and their occupation and agropastoral exploitation will take into consideration the protection of endangered species, notably the mountain gorilla. Following the protection needs and planned hydro-agricultural management, the transfer of these species from those unfriendly ecosystems is recommended.

Based on the accord, the Ministry of Public Works and Energy (MINITRAP) published temporary urban and rural planning instructions on 15 January 1997. Those ministerial instructions, n° MINITRAP/01/97, on habitat provide as follows:

Concerning urban habitat:

- It is forbidden to build on a plot other than that given or attributed . . . according to the master plan and the building regulation.
- Those who have built spontaneously must regularize their situation by requesting the boundaries of their plots according to the master plans where possible. The instructions explain plot registration methods for residents.
- The state is obligated to compensate previous (customary) residents during expropriation operations.

Concerning rural settlement:

- The village (imidugudu) is the settlement model for everyone. All Rwandese will be given plots and it is forbidden for them to build anywhere other than in those villages.
- The villages sites are determined by the communal council on proposals made by the technical commission in terms of:
  - Ease of access to basic infrastructure
  - Technical feasibility (topography, terrain, and type of village)
  - Proximity to agricultural fields (article 12).
- Construction of villages will proceed according to plans drawn up by MINITRAP after consultation with the Ministry of Habitat and Rural Development.

- Houses will be constructed according to MINITRAP plans which take into account regional differences.
- Prefectoral and communal habitat commissions will be created to apply ministerial instructions on habitat.

A.5.2 Draft legislation

MINITERE is drafting a law on habitat to be presented in 2003.

A.6 Protected Areas Legislation

A.6.1 Existing Legislation

- The Decree of 26 November 1934 (Belgian Congo National Parks Institute) creating Akagera National Park consists of a single article, "Is reserved, under the name of Akagera National Park, the part of Rwanda territory whose boundaries are indicated in the appendices of the present decree."

- ORU n° 52/48 (1957) created the hunting area of Umutara in Byumba territory, and gave responsibility for regulating hunting in this game reserve to the General Vice Governor or a delegate. The use of traps and guns with silencers is prohibited.

- Ordinance n° 52/175 (1953) prohibits bush and grass fires.

- The Decree of 26 November 1934 established the boundaries of the National Parc of Albert, which became Volcano National Park.

- ORU N°83 (1933) created the forest reserve of Nyungwe.

- Law decree of 26th /04/197 confirmed and modifying the ordinance of 1973 that created the Rwanda Office of Tourism and National Parks (ORTPN), which was the successor to the colonial National Parks Institute and Office of Tourism. The two major objectives of ORTPN are to:

    - Promote tourism and put into practice all means necessary to built tourism
    - Ensure that nature is protected, particularly fauna and flora and promote scientific research and encourage tourism in such a way that these two activities are compatible with the protection of nature.

- Decision n° 3 of the Cabinet Meeting of July 29, 1997, following recommendations of the Interministerial Commission changed the boundaries of the Akagera National Park, reducing its area from 250,000 ha to 90,000 ha.

A.6.2 Draft Legislation

After considerable study, legislation restructuring ORTPN is expected to pass in 2003. The restructuring process was facilitated by the International Gorilla Conservation Project (IGCP) at

the request of the Ministry of Commerce, Industry and Tourism. The objective was to improve ORTPN's management capability and performance by creating two separate institutions within the agency to address: (1) protected area management (the Rwanda Conservation Agency); and (2) tourism promotion (the Rwanda Tourism Agency). A wide range of stakeholders took part in the process, initiated in January 2002. In the final report, submitted in June 2002, one of the key recommendations was that priority be given to the legislative process for establishing these two institutions. In the draft bill responding to this recommendation the most important provisions are:

- The ORTPN will consist of two independent agencies: the Rwandan Tourism Agency and the Rwandan Conservation Agency, both under the authority of the Board of directors.
- The ORTPN has legal status and financial and administrative autonomy.
- It is under the authority of the Ministry of Commerce, Industry, and Tourism (MINICOM). Though its headquarters are in Kigali, the Rwandan capital, they can be transferred anywhere within the country if necessary.
- The objective of the Rwandan Tourism Agency objective is to promote tourism using whatever means will make the greatest contribution:

    - Establish the presence of Rwanda in international exhibitions.
    - Publish catalogs and site cards.
    - Promote a network of people to accompany tourists in important markets.
    - Use information technology to promote Rwandan tourism.
    - Build partnerships with operators of international and regional travel agencies.
    - Communicate with travel agents who specialize in the Rwanda experience.
    - Begin, coordinate, and facilitate tourism-related research.
    - Implement actions based on the strategic vision and policies identified by the ministry and multisector-based national plans.
    - Manage tourism to conform to national strategies and policies.
    - Create tourism plans.
    - Promote and diversify tourism services by identifying priority areas.
    - Promote community activities related to tourism.

The objective of the Rwandan Conservation Agency is to preserve the countryside and manage national parks and natural reserves, in particular:

- Ensure effective economic planning of tourist services in protected areas.
- Facilitate community tourism in territories close to protected areas.
- Begin the search for primates.
- Ensure tourist services for safaris and discovery of protected areas.
- Ensure good departments of reception, interpretation, and useful information for tourists from within as well as outside Rwanda.
- Ensure the efficiency and sustainability of tourist activities in protected areas.
- Ensure the efficient management of all tourist services, infrastructures, and activities in protected areas.

- Maintain the standards and operational efficiency of the public sector that insures tourism services inside protected areas and surrounding regions.
- Ensure the safety of tourists.
- Organize community tourism services for people living near protected areas.
- Ensure good communication with tourist agencies.

A.7 Public Health Legislation

A.7.1 Existing Legislation

Enactment of 19 July 1926 on hygiene and public health and Order N° 107 (1928) related to hygiene and public health

- Order N° 74 /345 (1959) on public hygiene in towns (with an appendix on the status of water)
- Order N° 71/18 (1949) forbidding the deposit of excrement at garbage dumps and in public places in cities
- Order N° 74/569 (1958) on regulation of irrigated agriculture to protect public health
- ORU N° 11/23 (1961) regulating provision of drinking water
- Order N° 375 (1940) on hygiene in the native divisions and unorganized traditional groupings
- Order N° 74/213 (1954) on the fight against quarantined diseases, epidemics, endemics, and other contagious diseases
- ORU N° 34 (1924) on creation and organization of public hygiene committees
- ORU N° 41/78 (1956) on regulation of unhealthy or dangerous establishments

A.7.2 Draft Legislation

A complete public health code was drafted in October 1998, but the ETOA team was unable to ascertain the status of the legislation.

A.8 Land Tenure Legislation

A.8.1 Existing Legislation

Land tenure law has evolved from the dual traditions of common law, particularly the claiming of land by families or lineages (and the Mwami right of eminent domain), and the written law instituted during colonial rule under Ordinance N° 8 (1927), which allowed foreigners to hold real property. After independence, the land tenure system did not change much from what it had

been in colonial times. Today, more than 90 percent of agricultural land is still controlled by common law; the written law is applied mainly in urban and commercial environments.

In March 1976, a law regulating the buying and selling of traditional land rights, Decree N° 99/76, was proclaimed. The intent was to harmonize the written and the common law. Since 1994 land regulation has become even more complicated; the Arusha Accords between the Government of Rwanda and the Patriotic Rwandan Front stipulate that all Rwandans who return are free to settle in any place of their choosing inside the country so long as the choice does not encroach upon the rights of others.

A.8.2 Draft Legislation

The GOR is currently drafting a land policy and law that will incorporate the following policy provisions:

- All Rwandans enjoy the same rights of access to land (implying that there can be no ethnic or gender discrimination).
- Title to all land should be registered so that it can be traded, except where doing so would fragment the land into plots less than 1 ha in area.
- Land use should be optimal. Households will be encouraged to consolidate plots to ensure that each holding is not less than 1 ha. There will also be a maximum size of 50 hectares allowed for any individual landowner. Families will be required to hold land in common to avoid fragmenting the land into parcels that are too small.
- Land administration will be based on a reformed cadastral system
- The rights of occupants of urban land will be recognized on condition that they conform to established rules.

The draft law specifies that:

- Persons occupying less than 2 ha and those with customary holdings of between 2 and 30 ha will be recognized as the rightful owners if they have a project and a development plan.
- Title deeds can only be transferred with the consent of all family members.
- A land tax will be imposed.
- Undeveloped land reverts to the state after three years.
- Holders of ubukonde land (originally distributed by the clan head) will have the same rights as other customary owners.

The objective of the draft policy and law is to improve land management while giving occupants of the land security. The draft policy calls for a minimum threshold of 1 ha for land holding, although the draft law does not say so explicitly. The draft policy and law seek to reduce poverty by encouraging production efficiencies through a modern commercialized agriculture sector. They make two critical assumptions: (i) families will pool land fragments together to create parcels large enough to qualify for development subsidies or receive special legal consideration; and (ii) land will be further concentrated through sales.

Those who have reviewed the drafts in detail point out that

- It is unclear whether lands under 1 ha in size will be eligible for title registration.
- The proposed policy forbids the allocation of "agro-pastoral" land to "non-professionals."

Both these provisions could have major implications for Rwanda's poor, but discussions with GOR officials and the land policy advisor for the Department for International Development (DFID) suggest that the policy and legislation are still very much in draft and have been subject to comment by a variety of organizations and individuals. Such discussions also suggest that the GOR will at first focus on land reform in urban areas, "where there is a greater desire for such action, and more willingness to pay."

It is clear that while the GOR has made efforts to broaden the consultative process in planning for critical issues of land use, consultations and communications are often one way, from government to those who will be affected. While the GOR says consultation is taking place, many NGOs active in rural development and civil society activities have not actually seen the draft policy or law. There is thus an urgent need for the consultative process to be expanded to assure widespread input from local populations, NGOs, and others working at the grass roots before basic policy decisions are reached.

A.9 Wetlands[1]-Related Legislation

A.9.1 Existing Legislation

- The Decree of 6 June 1952 related to ground water, lakes, and swamps and their use. It emphasizes the importance of water and provides measures to conserve water.

- The Ordinance of 1 July 1914 on contamination of springs, lakes, and wetlands. This ordinance requires administrators to determine the zones of protection for wetlands that provide potable water and forbids the public to construct houses, industries, or schools in those areas or to fill them in with soil, stones, etc.

A.9.2 Draft Legislation

- A draft bill on the development of swamplands was written as early as 1988. Its objective is to increase the amount of lands used for agriculture; to increase agricultural productivity by intensifying agriculture especially on land that lends itself to it; to improve farmer quality of life; to encourage farmer group activities and private initiatives; and to contribute to the general economic development and progress of the country.

[1] In Rwanda the term wetlands has been restricted to large permanent swamps; seasonal grass swamps have been generally classified as *marshlands* (equivalent to the French term *marais*). The draft legislation, however, treats a wide variety of sites as wetlands.

The bill sets forth the larger task of preparing the marshes for preliminary implementation of environmental impact studies, but these cannot begin until the results of a baseline study have been published. The bill also calls for classification of marshes according to their location, area, hydraulic potential and ecological importance. Such a classification would determine the choice of swamps to be fitted out and swamps to be preserved for their crucial role in the conservation of biodiversity—swamps are the preferred and sometimes the only environments that support certain species of mammals, birds, and reptiles.

- A bill on the conservation and management of wetlands presented in January 2003 supersedes the draft 1988 bill and to some extent responds to World Bank Rural Sector Support Project (RSSP) concerns about wetlands development in Rwanda. The bill, which is fairly comprehensive, addresses conservation and rational use issues in much more detail than the 1988 version. It is expected to pass pending incorporation of findings from the Integrated Protection and Management of Critical Ecosystems Project. The bill contains five titles:

1. General capacities, definitions, fundamentals, and objective principles
2. The legal status of wetlands
3. Institutions.
4. Incentive, preventive, and enforcement capacities
5. Final capacities.

Among aspects of the legislation that apply to the current ETOA study:

- **Article 1 of Title 1** fixes the general legal framework for conservation and the management of wetlands in Rwanda.

- **Article 2** makes the wetlands part of the common patrimony of the Rwandan nation and the world. Their conservation and management are necessary to maintain natural balances and are therefore of general interest.

- **Article 3** makes the wetlands a priority for the Rwandan Government because of their great economic, cultural, aesthetic, scientific, and recreational value, the disappearance of which would be irreparable.

- **Article 6** emphasizes that every person on Rwandan territory has the duty to contribute to the conservation and rational use of wetlands for their fundamental economic and ecological roles as regulators of water systems and biodiverse environments and as economic, cultural, aesthetic, scientific, and recreational resources.

- **Article 7** sets out the principles underlying the conservation and the durable management of wetlands:

    - The wetlands must be used in ways that are compatible with their natural functions and hydrological and ecological value.

- An environmental impact study is required before any activity can be undertaken that may have a negative impact on the wetlands.
- Special measures must be taken to protect wetlands, which are important globally and locally as ecosystems supporting a variety of species of fauna and flora, as well as for their cultural and aesthetic values, tourism potential, and irreplaceable hydrological and ecological functions.
- The sustainable use of wetlands must be integrated into national and local approaches to managing natural resources through education of the public.
- The conservation of wetlands and their flora and their fauna can be insured by integrating long-term national policies with international action through regional and international cooperation.
- Every person whose behavior or activities may damage wetlands is subject to a tax or a royalty and would by implication be responsible for all measures of restoration, on the principle that the polluter pays.

- **Article 8** makes it clear that the draft law is intended to:

  - Promote the conservation and rational use of wetlands
  - Establish the fundamental principles of conservation and rational use and protection of wetlands against any form of degradation
  - Insure the rational use of wetlands by protecting their ecological, economic, cultural, scientific, and recreational functions
  - Protect the capacity of the wetlands to stock waters and control floods
  - Regulate public access to and use of wetlands
  - Promote research on wetlands
  - Minimize and control pollution of wetlands
  - Set up institutional mechanisms to check present and future progressive infringements on wetlands
  - Promote regional and international cooperation in conservation and in sustainable management of wetlands

- **Article 9** applies the draft law to:

  - Swamps
  - Lakes
  - Permanent rivers, streams, and brooks
  - Seasonal, occasional, or irregular rivers, streams, and brooks
  - Seasonal, occasional lakes, including the puddles of the flood plains
  - Ponds and swamps
  - Peat bogs
  - Water sources
  - Geothermal waters
  - Fish-farming ponds;
  - Irrigated land, including irrigation channels and rice fields
  - Seasonally flooded agricultural land
  - Reservoirs, dams, and other water-restraining areas

- Excavations, gravel and clay pits, sand quarries, mine shafts, and ballast
- Waste-water treatment sites, including sewage farms, sedimentation ponds, and oxidation ponds
- Canals and drainage ditches

B. Other Pending Environmental Legislation

B.1 Draft Environmental Legal Framework

The environmental bill that has just been prepared with the assistance of the United Nations Environment Program (UNEP) (through UNDP, the U.N. Development Program) is expected to pass later this year. This law outlines the major principles of environmental management and protection; it is in part inspired by international conventions that Rwanda has signed. Thus, the protection and rational management of the environment and natural resources are based on the following principles:

- *Precaution.* Preventive steps should result from an environmental evaluation of programs, projects, or other socioeconomic activities, to avoid useless expenditures and environmental degradation, which is often significant and irreversible.
- *Lasting and fair allocation of natural resources between generations*
- *Polluter pays*
- *Public participation*
- *International cooperation*.

Certain aspects of this draft legal framework may affect USAID and other donor activities, among them:

- Article11, which regulates the management and use of agricultural land
- Article 14, which regulates imports and exports of any animal or vegetable products
- Article 19, which addresses the control of substances contributing to air pollution
- Article 24 and 25, which establish standards for managing waste (especially sewerage, hospital, and other dangerous wastes)
- Article 36, 37, and 38, which impose on project developers the obligation to perform environmental impact assessments (EIAs) and detail how they must be organized (these articles specify that the expense of an EIA will be born by the project promoter).
- Article 45, which stipulates standards for environmental protection and for imported products—though the document does not specify whether these are existing standards or how they will be defined. (The standards do not apply to exported products.)
- Article 72, 73, 74 and 75, which prohibit all types of waste in wetlands and rivers

The bill does authorize criminal prosecution for violators, but it does not cover:

- Biosafety and genetic transfer
- Environmental standards for commercial activities
- Management of pesticides and their environmental impact

- Quarry management and environmental norms for mining operations

Before this new legal framework, once passed, takes effect, implementing rules must also be passed into law. Experience suggests that this could take considerable time.

B.2 The Rwanda Environment Management Authority Bill

The draft REMA bill contains 25 articles in 5 chapters; the first creates a public institution called the Rwanda Environment Management Authority that has administrative and financial autonomy, a separate legal identity, and (see Article 4), the following responsibilities:

- REMA is the main organ in Rwanda of control, monitoring, and evaluation of how well environmental aspects are integrated into all development programs.
- It can order suspension or termination of activities that do not conform to any law related to the protection of environment.
- To fulfill its mission, REMA is invested with the following powers; it can:
    - Write budgets of funds needed for investment expenses and general funds, together with necessary reserves
    - Receive subsidies, donations, and gifts, and make legitimate disbursements
    - Associate itself with other enterprises and organizations, inside or outside of Rwanda, to achieve its objectives
    - Open bank accounts as needed, in conformity with the laws
    - Have access, without having to make an appointment, to each project site, installation, or industrial or commercial block where it suspects actions unfriendly to the environment in order to conduct inspections
    - Ask all GOR management units whose work affects the environmental sector to report on the environmental issues they encounter

B.3 Plant Protection and the Use of Pesticides

This draft bill, prepared by MINAGRI, is of great interest to several enterprises receiving support from USAID and other donors. It deals with:

- National phytosanitary monitoring and control
- Phytosanitary border inspections
- Regulation of pesticides
- Enforcement structures and their authority
- Criminal penalties for offenders.

MINAGRI annexed a presidential decree to the draft bill that specifies the membership of a Pesticide Commission: high-level representatives of ministries dealing with plant protection, the trade of imported plant products, environmental and human health, and the Bureau of Standards, as well as importers and users of pesticides. This decree will facilitate implementation of the law. Provisions regulating pesticides include:

- The approval process and authorization of products (Article.15, 16, 17, 19)
- Packaging and labeling (Article18)
- Prohibitions and exemptions (Articles 21, 22 and 23)

This bill gives all regulatory control of pesticides to MINAGRI, but it does not indicate that phytosanitary certificates will be required, even though MINAGRI presently requires and authorizes such certificates.

C. Local Government Legislative Framework

C.1 Provincial Structure

Law n° 43/2000 (2000) establishes and describes how provinces should be organized and should function. The law states that provinces should:

- Coordinate developmental activities in districts and towns
- Help districts and towns implement the general policy of the state
- Ensure the security of people and goods.

The Directorate in Charge of Technical Affairs and Infrastructures is responsible for environment, forests, agriculture, and livestock services at the province level.

C.2 District Structure

Law N° 04/2001 (2001) sets up districts and defines how they are to be organized and to function. It allocates responsibilities for both law and regulations with regard to policy, administration, the economy, the welfare of the population, and culture. The district is especially responsible for the following sectors within its boundaries:

- Agriculture, animal resources, and forestry
- Commercial activities
- Health centers
- Sanitation
- Water works and their maintenance
- Tourism and the environment
- Land use; organization and distribution of plots
- Environmental protection (one of the specific responsibilities of district commissions for culture and social welfare)

Each district is under the authority of a district council — made up of coordinators elected at the sector level and representatives of women and youth — and of an executive committee assisted by the Executive Secretary, as well as of a development committee whose principal mission is to set up and control district development activities.

The mayor of each district is elected, as are sector coordinators and members of the district council.

C.3 Sectors and Cells

Presidential Order N° 2/01 (1999) modifies and completes the 1998 Presidential Order N° 37/01 that authorized sectors and cells. The more recent order specifies the responsibilities of the sectors and of the Cells Council. Article 6 of the same order specifies the duties of sector authorities with regard to development and the environment.

C.4 Urban Authorities

Law N° 5/2001 (2001) details the organization and functioning of urban authorities, assigning them the following duties with regard to the environment:

- Promotion of tourism and environmental protection in towns
- Promotion of agriculture, livestock, and forests in towns
- Other functions similar to those required of the districts.

C.4.1 The City of Kigali

Law N° 07/2001 (2001) details the organization and administration of the city of Kigali. It clearly defines the duties of the city with regard to the environment. In particular, Article 21 states that in collaboration with the relevant GOR departments, the Kigali City Council is responsible for managing and promoting development activities in the city especially in the following areas:

- Designing area plans in the various localities
- Preparing a master plan for transportation of people and goods
- Organizing and supervising the public transport system
- Establishing and managing green areas and public parks
- Establishing areas for resettlement of people displaced by urban development and designating areas for residential, commercial, industrial, and public parks
- Establishing a program to halt slum development
- Maintaining the physical infrastructure, such as roads, bridges, water drainage systems, and boulevards
- Controlling installation of sign posts and naming streets
- Lighting streets and public buildings
- Planning for public infrastructure development
- Planning for expansion and management of public cemeteries
- Providing safe drinking water sources and protecting the environment
- Improving general cleanliness and collection, transport, and treatment of solid wastes
- Establishing a city-wide plan for buses and taxi stops
- Promoting social welfare, culture, and sports
- Promoting education, public health, trade, industry, and handicrafts;
- Promoting cooperation between Kigali and other cities
- Managing all other activities in the city that are not supervised by the central government

D. The Judicial Framework

D.1 The Judiciary Branch

The judiciary branch, which is independent of the other branches of government, is intended to be the guardian of rights and public liberties. The four levels in the judiciary are the District Tribunal, the Tribunal of First Instance, the Court of Appeals, and the Supreme Court.

The Fundamental Law authorizes specialized jurisdictions; it is under this law that the Gacaca jurisdictions and the Specialized Chambers for genocide trials were established and that an environmental jurisdiction is planned once the environmental law is passed.

D.2 Criminal Law

Under Rwandan criminal law, the authorities in charge can introduce cases either based on individual complaints or on their own initiative. When sufficient proof of fault has been obtained, the case is transmitted for trial.

The Rwandan Penal Code provides for sanctions against persons responsible for bush fires, forest fires and forest degradation, and setting fire to agricultural fields.

E. International Conventions and Treaties

The GOR has ratified several U.N. conventions and agreements on the protection of the environment and sustainable development:

- The 1992 Rio Convention on Biological Diversity, ratified by Rwanda on 18 March 1995
- The 1992 Convention on Climate Change, ratified on 30 June1995
- The Convention to Combat Desertification, ratified on 22 October 1998
- The Convention on Prior Informed Consent (PIC), which applies to dangerous chemicals and pesticides sold across national borders, signed on 11 September 1998
- The Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer, signed on 6 December 2000
- The Cartagena Protocol on the Prevention of Biotechnical Hazards, part of the convention signed in Nairobi in May 2000
- The 2001 Stockholm Convention on Persistent Organic Pollutants (POP), ratified in June 2002.

SECTION VI

Institutional Framework for Environmental Management

A. Government Institutions

In Rwanda, managing and protecting the environment is the responsibility of the Ministry for Lands, Human Resettlement, and Environmental Protection (MINITERE), where it is coordinated by the Directorate of Environmental Protection. However, since 1994, the ministry has lacked both personnel and material resources.

To improve environmental management, MINITERE has proposed the creation of L'Office Rwandais de l'Environnement (ORE)/Rwanda Environment Management Authority (REMA) to coordinate environmental management broadly. Without implementing legislation to give teeth to MINITERE and REMA, control of the environmental sector is now scattered throughout a number of ministries, with very little coordination and often considerable redundancy and conflict in approaches. The ministries involved in environmental management in Rwanda are described briefly below.

A.1 The Ministry of Lands, Reinstallation, and Environment (MINITERE)

MINITERE's environmental mission is to establish and monitor the execution of plans for preserving and protecting Rwanda's natural resources (flora and fauna) and environment, and to ensure that development activities are sensitive to environmental protection. The ministry drafts environmental policy and legislation and ensures monitoring and compliance. Its five departments deal with lands, habitats, environmental protection, human resources and support services, and planning and judicial affairs.

MINITERE has already adopted a national strategy on biodiversity conservation. It is also responsible for proposing and negotiating international conventions on the environment.

A.2 The Ministry of Commerce, Industry, Tourism, Investment Promotion, and Cooperatives (MINICOM)

MINICOM is responsible for protecting, conserving, and managing national tourist sites and parks, among them Nyungwe Forest Reserve. Its five departments are the directorates of planning and support services, industry and handicrafts, internal commerce, and external commerce, and the Office of Tourism and National Parks (ORTPN).

ORTPN was created in 1974 and charged to:

- Promote tourism and use all means necessary to increase tourism
- Protect nature, particularly fauna and flora, and promote scientific research; and encourage tourism in ways that are compatible with protecting nature
- Propose to the GOR negotiation of accords that directly or indirectly address nature protection and tourism

- Draw up and propose to GOR classification schemes for sites and buildings that are of historical, cultural, scientific, archeological, or tourist interest.

MINICOM is currently restructuring ORTPN so that it can better accomplish its dual mission of protecting nature and promoting tourism, particularly ecotourism.

A.3 The Ministry of Agriculture, Livestock, and Forests (MINAGRI)

MINAGRI has the following mission:

- Initiate, develop, and administer programs of agriculture transformation and modernization in Rwanda
- Design and manage programs to promote and improve the production of livestock and fisheries so as to increase the contribution of these sectors to the national economy
- Develop and efficiently manage national forest resources without damaging the ecology, and integrate forest resource development into other agricultural activities.

MINAGRI is organized into eight departments (agriculture, livestock, forests, awareness and marketing, rural engineering, soil conservation, livestock production, and agriculture planning and statistics), and has a state secretariat in charge of forests.

The MINAGRI agriculture strategy focuses on forest plantation development, soil protection and conservation, and improved livestock and fisheries production, including aquaculture. It has established procedures for conservation and development and development of wetlands as well as for the protection of valleys and hillsides. The ministry requires EIAs for all its marshland development, agriculture, and livestock projects.

A.4 The Ministry of Infrastructures (MININFRA)

MININFRA has the following responsibilities:

- Initiate and coordinate actions that promote the efficient exploitation of energy and home and industry access to energy
- Initiate and promote actions that exploit nonconventional energy sources, such as solar, biogas, and peat
- Establish policies and strategies aimed at the management and appropriate utilization of natural resources, such as water
- Manage and coordinate the registration, prospecting, and analysis of the quality of mines
- Supervise the development and maintenance of public infrastructure, with particular attention to public facilities, especially energy support systems, water supplies, and sewage.

MININFRA has secretariats for water and natural resources and for energy and communication, plus eight departments: planning, water and sanitation, mines and geology, communication, transport, urban development, public infrastructure, and roads.

The ministry has set policies on water and sanitation (the latter policy has been drafted but awaits finalization) and guidelines for hygiene and space sanitation in villages, and towns. MININFRA requires EIAs for all proposed road construction and provides guidelines for erosion control. The environmental impact of mine prospecting and exploitation is under study, with special attention to rehabilitation measures for mine-damaged lands.

A.5 The Ministry of Education, Science, Technology, and Scientific Research (MINEDUC)

As part of its mission, MINEDUC has begun to integrate an environmental dimension into its curricula at the primary, secondary and tertiary levels. Specialized establishments under the authority of MINEDUC, among them the National University of Rwanda, the Kigali Institute of Science, Technology, and Management, and the Kigali Institute of Agriculture and Veterinary Science, carry out considerable research on environmental protection, MINEDUC has a secretariat for primary and secondary education and a general directorate for scientific research and technology. The ministry's five departments are: educational studies and planning, higher education, scientific research and technology, pre-education and primary education, and secondary, technical, and vocational education.

A.6 The Ministry of Local Administration, Information and Social Affairs (MINALOC)

MINALOC is charged to set and manage the GOR policy on decentralization and good governance; it supervises local administrative structures at the province, district, town, sector, and cell level. MINALOC has a secretariat for good governance and one for social affairs, where the Rwandan Office of Information (ORINFOR) is placed. The ministry is responsible for information and population education. Its five departments are: planning and local development coordination; territory administration; information; family and population education; and social planning and protection of vulnerable groups.

MINALOC integrates environment into the policies and strategies that are implemented by the decentralized entities—provinces, districts, towns, sectors, and cells.

B. Universities and Research Organizations

B.1 The National University of Rwanda

The National University of Rwanda (NUR) was created in 1963 to provide higher education in a variety of fields. Its role in environmental management and protection consists of training and building the capacity of scientists and researchers in the natural sciences and improving both the knowledge base and methods of conservation and environmental protection. NUR conducts both basic and applied research as determined by national priorities. Some of its areas of research respond directly to environmental concerns:

- **Agriculture**. Soil conservation, plant and animal production, and diversification of products for export

- **Health**. Solutions to health problems and adaptation of medical practices to the Rwandan socioeconomic context; research on reproductive and genetic health; development of traditional medicines

- **Natural and applied sciences**. Development of new and renewable energy sources (solar energy, biogas, etc.); geochemistry and geophysical prospecting; eco-development and balancing population and resources in terms of ecosystem equilibrium; protection and conservation of natural ecosystems and increasing their value

- **Social Sciences**. Increasing knowledge of the physical and sociocultural areas of Rwanda; promoting culture and education in a good and viable environment; increasing scientific, technical and cultural education at all levels.

Recently, NUR has added two elements that will contribute significantly to its environmental management mandate. First, the Faculty of Agronomy has created an Environmental Research Coordination Unit composed of the departments of biology, agronomy, geography, and economics. Its purpose is to better coordinate environmental research, place existing programs in perspective, avoid redundancy, and provide a better framework for multidisciplinary research.

The second element is NUR's GIS and Remote Sensing Center. This Center, established with USAID/PEARL assistance, serves as a clearing house for all Rwanda's geographical databases, thus enabling it to provide key information in key decision-making processes. It also provides mapping and remote sensing services of rura[2]l and urban areas to the private and public sectors in addition to providing training for university students and government departments.

B.2 Institute of Agronomic Sciences of Rwanda (ISAR)

ISAR's mission is to:

- Promote the scientific and technical development of agriculture and livestock
- Carry out research and experimentation to improve agriculture and livestock
- Publish and diffuse research results
- Manage research stations and centers of experimentation throughout the country

ISAR works primarily to improve crop and livestock breeding and to reduce major constraints on the agriculture sector by promoting improved varieties, soil conservation, soil fertility, harvesting and storage technologies, and biotechnology.

The Institute has a long record of accomplishment in forestry research, erosion research and control, and management and improvement of soil fertility. Its Forestry Research Department at Ruhande currently has a collaborative on-farm research program (the African Highlands Initiative) with the World Agroforestry Center (ICRAF) in Nairobi, which works to improve and better manage soil fertility using agroforestry plant species. ISAR also has reforestation and

[2] The Center conducted a study on status of Gishwati Forest Reserve in 2002.

natural forest regeneration research programs, a national tree seed center, and an arboretum with many local and exotic species (ex-situ conservation).

B.3 Institute of Scientific Research and Technology (IRST)

IRST was created in 1989 to replace the National Scientific Research Institute. Its mission is to undertake scientific and technological research directly related to Rwanda's socioeconomic development, with particular emphasis on the use of technologies that help preserve the environment. To this end, IRST has two research centers:

- The Energy Center works on renewable energy technologies such as solar energy and biogas, and on wastewater management.

- The University Center on Pharmacy and Traditional Medicine (CURPHAMETRA) is charged with exploiting the value of Rwanda's medicinal plants. The center produces a variety of pharmaceuticals from plants with known curative properties. Among them are pomades, pills, and disinfectants that are already used by the local population to cure a wide variety of illnesses. .

IRST also has a Center of Rwandan Herbs that promotes the ex-situ conservation of medicinal plants and other useful herbs in a herbarium used by the NUR and others for research.

B.4 Kigali Institute of Science, Technology, and Management (KIST)

KIST has an environmental program in its science and technology department that is essentially concerned with biogas development, waste management, and increased environmental awareness at all levels by publishing education, information, and communications programs. KIST is also interested in renewable energy sources like solar energy. Environmental management is one of the core subject areas that KIST's administrators intend to strengthen in the future.

C. Civil Society Organizations Supporting Environmental Management

Local NGOs have a long record of accomplishment in Rwanda's environmental sector, and considerable experience in mobilizing human and financial resources and operating directly in the field without heavy administrative structures. The principal NGOs concerned with environmental protection in Rwanda are:

- Action Technique pour un Développement Communautaire (ATEDEC)
- Agence Rwandaise pour le Développement et la Coopération (ARDEC)
- Association Les Compagnons Fontainiers du Rwanda (COFORWA)
- Association de Recherche et d'Appui en Aménagement du Territoire (ARAMET)
- Association de Solidarité des Femmes Rwandaises (ASOFERWA)
- Association pour la Conservation de la Nature au Rwanda (ACNR)
- Association pour la Promotion de la Femme « DUTERIMBERE »
- Association Pro-Femmes « TWESE HAMWE »
- Association Rwandaise des Artisans (KORA),

- Association Rwandaise des Ecologistes (ARECO-RWANDA NZIZA)
- Association Rwandaise pour l'Environnement et le Développement Intégré (AREDI)
- Association Rwandaise pour la Promotion du Développement Intégré (ARDI)
- Association Rwandaise pour le Bien-être Familial (ARBEF)
- Bureau Episcopal de Développement (BED)
- Centre de Formation et de Recherche Coopérative (Centre IWACU)
- Conseil de Concertation des Organisations d'Appui aux Initiatives de Base (CCOAIB)
- Conseil Protestant du Rwanda (CPR)
- Duharanire Amajyambere y'Icyaro ou Action pour le Développement Rural Intégré (DUHAMIC-ADRI)
- Green Environment Conservation (GEC)
- Institut Africain pour le Développement Socio-économique au Rwanda (INADES-FORMATION-RWANDA)
- Jeunesse Ouvrière Catholique (JOC)
- Reseau d'Evaluation d'Impacts Environnementaux dans les Pays des Grands Lacs (REIE-PGL)
- Rwanda Environment Awareness Services Organization Network (REASON)
- Rwanda Rural Rehabilitation Initiative (RWARRI)

The activities of these NGOs vary from education, training, and promoting public awareness and participation in sustainable natural resource management to environmental programs targeting women, youth, farmers, herders, artisans, and other trades people. Most of these initiatives help reinforce civil society's role in environmental strategy, policy, and legislation. The five NGOs visited by the ETOA team are described next.

C.1 L'Association pour la Conservation de la Nature au Rwanda (ACNR)

ACNR was created in 1992 to:

- Promote public awareness of the importance of biodiversity and its conservation
- Help promote research on fauna and flora and the functioning of natural ecosystems
- Suggest ways to sustainably manage Rwanda's natural heritage.

ACNR aims to sensitize the Rwandan people to nature conservation and preservation particularly by teaching them early; it has established nature clubs in primary, secondary, and high schools. The organization has published an environmental education manual in Kinyarwanda that addresses the main threats to the environment and proposes political and judicial measures that might solve them. ACNR operates through nature clubs throughout the country.

Currently, ACNR is working on the Nyabarongo and Akanyaru wetlands to determine biodiversity areas that are critical for birds. Once published, the report will be used as the basis for a strategy to protect those sites in collaboration with local authorities and communities.

C.2 L'Association Rwandaise des Ecologistes (ARECO-RWANDA NZIZA)

ARECO was also created in 1992; its objectives are to:

- Sensitize the population to the importance of nature conservation and protection
- Promote tourism
- Promote environmental safety for sustainable development
- Defend consumers' rights and help consumers obtain clean and safe products.

ARECO organizes interscholastic competitions on poetry, dance, songs, and art related to environmental protection. It also organizes primary and secondary school study tours to protected areas and other natural reserves to develop environment skills at an early age.

C.3 Association Rwandaise pour l'Environnement et le Développement Intégré (AREDI)

AREDI, created in 1997, aims to protect the environment with the active participation of the local community. Its core activity is promoting EIAs for any activity that is likely to adversely affect the environment. AREDI has conservation education programs in Nyungwe and is planning a project on wetlands conservation. Recently, AREDI helped a farmer's association in Nyungwe buy and rehabilitate a small sawmill; it is currently negotiating a harvesting contract for a portion of Nyungwe's buffer zone tree plantations. According to AREDI, the contract will provide for replanting of all harvested areas.

C.4 Green Environment Conservation (GEC)

GEC is a community-based organization that uses a participatory approach for disseminating improved wood-burning stoves and planting trees in village settlement sites. It conducts rapid appraisals to determine the role of women in kitchen gardens of vegetables, homestead hygiene, termite control, and management of water resources, especially in imidugudu (settlement villages) and surrounding areas.

C.5 Reseau d'Evaluation d'Impacts Environnementaux dans les Pays des Grands Lacs (REIE-PGL)

The EIA Network in the Great Lakes Countries was created in 1998 to build professional capacities in environmental impact assessment and to encourage the exchange of experiences among professionals in Africa and beyond. The network is comprised of three countries (Rwanda, Burundi and the Democratic Republic of the Congo), and nine NGOs, three of which are from Rwanda (ACNR, AREDI and HELPAGE RWANDA), which support groups of elderly persons seeking to extract value from biodiversity, and RWARRI: Rwanda Farming Initiative). REIE-PGL activities include:

- Organizing regional seminars to exchange information on how the law affects management of the environment in the three countries
- Training environmental specialists of the region on environmental impact assessment
- Creating an inventory of how armed conflicts have affected the environment in Burundi, Rwanda, and the Democratic Republic of Congo

- Promoting national EIA legislation
- Producing periodic and annual reports
- Publishing a newsletter for the network.

D. Multilateral and Bilateral Organizations, International NGOs and the Private Sector

Exhibit 6.1, though by no means inclusive, does demonstrate the kinds of organizations involved in environmental management in Rwanda and what they are doing.

Exhibit 6.1 Organizations Active in Environmental Management in Rwanda

Institutions	Main Area of Focus	Comments
Multilateral Organizations		
UNDP	Represents the interests of U.N. agencies concerned with the environment that are not present in Rwanda (UNEP and GEF). UNEP itself is mandated to "provide leadership and encourage partnerships in caring for the environment by inspiring, informing and enabling nations and people to improve their quality of life without compromising that of future generations."	UNDP is the major donor coordinating support to GOR's environmental program. Has assisted through conventions on biological diversity, and preparation of the National Strategy on Biodiversity and its Action Plan. Also supported the process of drafting the law establishing the regulatory framework for environmental management.
FAO	Promotes food security through agriculture and livestock development without compromising rational use of natural resources and the environment. Special interest in sustainable agriculture, combating desertification and natural disasters like famines, integrated management, and wetlands management.	No active environmental programs currently
World Bank/IMF		
Rural Sector Support Project	RSSP is a 14-year plan in three phases. Phase I is building the institutional and technical capacities needed to support generation and adoption of efficient cropping and post-harvest technologies to launch the intensification process; it has seven components. The first will empower beneficiary farmers to efficiently manage marshland/hillside cropping and livestock activities and promote adoption of improved soil, water, and fertility conservation techniques; and will encourage private operators to take on land and water infrastructure construction and maintenance.	Environmental assessment for the RSSP provides for: supplying guidelines and an environmental code of conduct for contractors (adopting good site practices will minimize disruption of hydrology and water quality); creating buffer zones, diversifying crops, and establishing a biodiversity conservation and agroforestry program to diminish biodiversity loss; monitoring the nitrogen and phosphorus content of drainage water to minimize changes in surface water quality; using vegetation to establish buffer zones to filter sediments and planting trees and grasses on hillsides. Strong analysis of environmental impacts of marshland reclamation.

Institutions	Main Area of Focus	Comments
Rural Water Supply and Sanitation Project	Aims at increasing water supply and sanitation services in rural areas. The main components are: (1) grants to communities for constructing water and sanitation facilities; (2) rehabilitation of major water supply systems and establishing sustainable management for them; (3) strengthening stakeholder capacity to perform the tasks required within the rural water supply, and sanitation strategy.	Environmental assessment recommendations include strengthening monitoring and management testing capacities; canalizing water to ensure pasture lands, and installing the necessary controls to ensure water quality.
Integrated Protection and Management of Critical Ecosystems Project (GEF)	The objective (under MINITERE) is the conservation and sustainable utilization of natural resources in critical ecosystems. The first phase deals with wetlands (Akgera, Rweru-Mugesera, Urugezi and Kamiranzovu); future phases will deal with highlands. The major components are: drafting policy and legislation for sustainable management of natural resources; strengthening human and institutional capacities for decentralized management of ecosystems; and design and implementation of wetlands management plans	Consulting firm EXPERCO is assisting MINITERE with the pre-project studies, which should be available by mid-2003. The studies will be directly relevant to USAID-supported marshland rehabilitation activities.
African Development Bank		Forest rehabilitation project for Gishwati and Mukura reserves. No detailed information on this or other ADB Rwanda programs is available.
World Food Program (WFP)	Uses food for work for marshland reclamation	No active environmental program, although there are guidelines used for marshland rehabilitation. One WFP concern is lack of sustainability (and the environmental implications) of marshland reclamation programs. Reclaimed sites have been abandoned after 1-2 years, perhaps because there is no ownership infrastructure.
European Union	The current program is largely the result of post-genocide interventions since 1995 related to: human rights, justice, and rural development as sustainable interventions; support to a structural adjustment program (education, health, justice, and debt relief) and support to NGOs on human rights and *Gacaca;* general support to the Ministry of Finance, with funding for the census, micro-projects, and decentralized social development projects. Also support for roads, rural water, and repair of key buildings (e.g., the Parliament) and for education or health.	EC is rumored to be working with MINAGRI on harvesting plan for buffer zone plantations around Nyungwe, and in developing an environmental strategy for MINAGRI. (EU Rep was on leave during ETOA team visit.)

Institutions	Main Areas of Focus	Comments
Bilateral Organizations		
USAID-supported activities		
Agribusiness Development Assistance to Rwanda (ADAR); Chemonics International	ADAR's objective is to expand internal production and marketing chains that promote broad-based economic growth and increase the volume and value of marketed agricultural products. The project offers technical assistance and services in market research and product improvement, norms and standards, prices, shipping, processing, and improved access to markets, and service-oriented extension approaches. Its agribusiness center acts as a forum for information exchange and eases contacts between promoters and investors. ADAR cooperates closely with World Bank projects and UNIDO's CAPMER project, which helps small entrepreneurs and has already established links with co-operatives, associations, and farmers in the provinces of Kigali Ngali, Kibuye, Gisenyi, Ruhengeri and Butare on production, processing, and marketing of coffee, tea, volcano potatoes, ornamental flowers, apples, bananas, and pyrethrum.	A study on "Environmental Management Systems for Agribusinesses in Rwanda" prepared under the ADAR project offers examples of environmental mainstreaming and management capacity building.
Partnership for Enhancing Agriculture in Rwanda (PEARL) (MSU, Texas A&M)	PEARL offers advanced training in agricultural sciences for Rwandan partner institutions (NUR, ISAR, and KIST) and outreach and development in rural communities. The PEARL Outreach Center will be a conduit for transmitting resources from NUR, ISAR, and other institutions to rural communities. PEARL is testing new maize, pepper, and passion fruit species for Rwandan farmers to enable them develop the agribusiness sector. It is also working with coffee farmers in the Maraba district to help them produce and the American specialty coffee market PEARL is working with the NUR Faculty of Agriculture to help it better respond to the needs of stakeholders and rural producers.	PEARL helped establish a GIS and Remote Sensing center at NUR which serves as a clearing house for all Rwanda's geographical databases, allowing it to provide key information for decision-making. It will also provide mapping and remote sensing services of both rural and urban areas to the private and public sectors in addition to training university students and government departments.

Institutions	Main Area of Focus	Comments
ACDI/VOCA	This international NGO s supported in Rwanda by the USAID PL 480 Title II Food for Development Project. To finance USAID development activities in Rwanda, ACDI/VOCA's monetization program holds monthly auctions of refined vegetable oil. ACDI's program focuses on: 1) natural resource management (helping farmers increase production, restore and protect cropland, and increase their incomes) ; and 2) agribusiness development (strengthening the business skills of cooperatives and increasing their involvement in agricultural markets for both staple and cash crops. This component includes some rural road rehabilitation.	Food for work is used for public works projects (road and bridge rehabilitation) but not for on-farm activities. ACDI/VOCA reports problems on local capacity for conducting EIAs for bridge renovation.
AFRICARE	International NGO	No current support from USAID, but USAID has supported its Local Government Initiative (LGI), currently managed by the International Rescue Committee (IRC). Africare (Dr. Gaspard Bikwemu) developed guidelines for EIAs of some aspects of community development projects, primarily for construction projects (schools, health centers, markets, slaughterhouses, water supply, power supply, and road/bridge rehabilitation), but also for agricultural projects, including wetlands development
Catholic Relief Services	International NGO with PL 480-funded project to build the food security of small farmers and their families by enabling them to produce extra crops in the lowlands. This is done by restoring agricultural marshlands, which increases the amount of land available for planting, and managing water sources, which expands the planting seasons. CRS also works to reduce erosion on the steep hills above lowlands under development through terracing and other technologies to increase productivity. The project also works to strengthen farmers' associations and rehabilitate roads that connect lowlands and nearby markets.	CRS does good IEE but admits it is difficult to monitor impact. Also concerned that original project design does not reflect current social and economic needs.

Institutions	Main Area of Focus	Comments
Family Health International/IMPACT	International NGO working to control and prevent AIDS.	Expressed concern about medical waste disposal. Systems for collection and elimination of medical wastes in Rwanda are for most centers very poor. A survey of 12 health centers found that the majority : (i) did not have functioning incinerators; (ii) did not block public access to disposal sites; (iii) burned wastes in the open or threw them into uncovered holes. Only two centers had satisfactory systems for collection and disposal of wastes.
Population Services International	International social marketing NGO undertaking in Rwanda an insecticide-treated mosquito net (ITN) project in conjunction with MINISANTE's National Malaria Control Program.	Working with USAID's Regional Environmental officer, PSI undertook a detailed "Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP)." It addresses pesticide safe use and handling for the PSI/Rwanda-led social marketing of ITN SUPANET and Karishya SUPANET retreatment) in Rwanda
International Gorilla Conservation Program (IGCP)	Created in 1991 with support from a coalition of AWF, Fauna and Flora International (FFI), and WWF. It works with the governments of Rwanda, DRC and Uganda to help address priorities for the sustainable management and conservation of mountain gorillas and afromontane forest habitats. In Rwanda, IGCP has helped with ORTPN restructuring, provides ORTPN with logistics and infrastructure support and training, and helps with park protection and tourism development.	IGCP has created wildlife clubs in schools; built a para- ORTPN local defense force in communities to help maintain park security; supports a local NGO, Animateurs de la Conservation, which carries out sensitization programs; helps a local beekeeping association to relocate beehives from inside the park to suitable locations outside; built a curio shop for the use of artists from the Project pour la Promotion de Petites et Moyennes Entreprises Rurales; and facilitated negotiations between the Commune of Kinigi and a private company, Musiara Ltd. to build a high-end tourism lodge outside the PNV (IGCP bought the land and gave it to the community, which will lease it to Musiara.
World Vision	Maintains a PL 480-funded project to increase farm production through terracing, marshland reclamation, and other interventions (which represent about 10 percent of the WV program).	Works in Byumba, Ruhengeri, and Gikangoro, currently only active on terracing; the International Agriculture Development Fund (FIDA) was supposed to coordinate with WV for marshland rehabilitation but project was cancelled. Considerable experience in terracing but problems with tenure, focus on radical terraces vs. progressive terraces, etc. Suggests that development projects need clearly stated objectives for monitoring.

Institutions	Main Area of Focus	Comments
World Relief	International NGO funded by USAID under the Rwanda Women's Network. WR begins begin work in March with community groups in Ruhengeri and Byumba on distillation of essential oils from geranium and eucalyptus, with possibilities also for rosemary, citronella, and vetiver.	Groups and sites have not yet been identified yet; there is some concern about the provision of wood fuel for the distillation process.
PRIME II	A partnership combining leading global health care organizations dedicated to improving the quality and accessibility of family planning and reproductive health care services throughout the world. Funded by USAID and implemented by the University of North Carolina at Chapel Hill School of Medicine, PRIME II focuses on strengthening the performance of primary care providers as they work to improve services in their communities.	Has also expressed concern about medical waste disposal.
Canadian Development Program Support Service	Active program for returnees around Akagera National Park on water source development, marshland rehabilitation, and woodlots.	
Other International NGOs		
CARE International	International NGO	No current environmental activities.
World Conservation Society (WCS) (Projet Conservation de la Fôret de Nyungwe)	Current project for the conservation of Nyungwe forest was initiated by WCS to help ORTPN and others. Started in 1998, it contributes to conservation of the forest by promoting ecotourism, ecological research and education, and environmental awareness, and training personnel in conservation and biodiversity	WCS has submitted a proposal to GEF for additional funding for activities in Nyungwe. Project objectives are to: conserve the forest by finding alternatives for generating income; strengthen forest management structures; and establish incentives to address causes of biodiversity loss. Approval is expected in March/April 2003.
Diane Fossey Gorilla Foundation/International	Mainly concerned with gorilla conservation.	Also supports the Karisoke center on research on flora and fauna of Volcano National Park.
Diane Fossey Gorilla Foundation/Europe	International NGO, working 20 percent on gorilla conservation and 80 percent on community development. The latter include trying to transfer "illegal" activities in the park to areas outside it. Works though local NGOs on beekeeping, rain water collection systems for schools and churches, micro-credit for women's associations; works with local artists associations (sculpture, wood processing, and ceramics); supports the Affected Indigenous People's Organization in its work with Batwa, providing land, tools, seeds, and training in agriculture; works with farmers' associations on improved farming systems, organic agriculture; and works with the Virunga Wildlife Clubs to establish wildlife clubs in local schools.	

Institutions	Main Area of Focus	Comments
Agro-action Allemande	German development service with programs on health and natural resources management, oriented to agroforestry and increasing agricultural productivity.	
Other Organizations		
German Technical Cooperation (GTZ)	German consulting firm	GTZ is the agency implementing the PRORENA project ,which protects natural resources in the Akagera National Park. PRORENA supports boundary reconnaissance and demarcation, ecological and biodiversity studies, local capacity-building/training of guides, and rehabilitation of roads.
Volcano Safaris	Private tour company	Will be building a luxury tented camp in Ruhengeri. Land bought by AWF, given to community, which leases to Volcano
EXPERCO International	International branch of HBA Group Experts-Council. Specializes in rural development and environment; agriculture, energy, civil engineering, industry, and information systems.	Has completed a study on environmental management for livestock activities ("Plan for Livestock Development in Rwanda") Currently working on integrated wetlands study and management of Kagitumba and Muvumba wetlands for MINITERE critical ecosystems.
OntheFRONTIER	Private consulting firm	Implementing innovation and competitiveness project for the GOR. Developing tourism master plan to include a primate and a folklore circuit. Projects 70,000 tourists a year in 10 years.
COGELGAZ JOINT VENTURE-BRALIRWA. BCDI	Jointly owned by BCDI (Bank of Commerce and Development and Industry) and the BRALIRWA brewery; dedicated to promoting development of a prototype gas recovery and power generation installation.	COGELGAZ has commissioned a consulting firm to conduct studies of the feasibility of establishing small (20– 5 MW) modular but expandable extraction and power generation platforms/barges to supply electricity to industries along the Kivu coast. Limited EIA activity to date.
Federation Rwandaise du Secteur Prive	Groups all merchants and private industries in Rwanda. Goal is to invest in durable and replicable development of business and industry and to promote better production and improved technologies	No environmental focus as yet but good potential for establishing an environmental framework for business and industry

SECTION VII

Environmental Status: Threats and Opportunities

A. Aquatic Resources

Rwanda's hydrology is characterized by a dense network of lakes, rivers, and wetlands. Approximately 210,000 ha, 8 percent of the entire country, are under water; lakes occupy about 128,000 ha, rivers about 7,260 ha, and water in wetlands and valleys about 77,000 ha.

The country is divided into two major drainage basins, the Nile to the east and the Congo to the west. The Congo basin covers 33 percent of Rwanda and handles 10 percent of all national waters. The Nile basin covers 67 percent and delivers 90 percent of the national waters. The Nyungwe Forest is Rwanda's major watershed for both the Nile and the Congo basins. The waters of the Nile basin flow out through the Akagera river system, which contributes 8 to 10 percent to the Nile drainage system.

A.1 Lakes and Rivers

Rwanda's hydrological network includes numerous lakes (the major ones are Kivu, Bulera, Ruhondo, Muhazi, Cyohoha, Rweru, Sake, Gaharwa, Kilimbi, Mirayi, Rumira, Kidogo, Mugesera, Nasho, Mpanga, Ihema, Mihindi, Rwampanga, and Bisoke), and rivers (the major ones are the Akagera, Nyabarongo, Akanyaru, Ruhwa, Rusizi, Mukunga, Kagitumba, and Muvumba). This network and its associated wetlands contain a wide variety of plant, animal and aquatic species; 104 plant species alone have been recorded.

A.1.1 Threats

Without quantifying them, Mukwaya (1998) suggests some of the threats to Rwanda's major lakes:

Exhibit 7.1. Threats to Lakes

THREAT	LAKE				
	Muhazi	Mugesera	Sake	Nasho	Rwampanga
Coastal habitat destruction	x	x	x		x
Eutrophication					
Water extraction	x	x			
Introduction of exotic species	x	x	x	x	
Artisanal fishing (perhaps harmful)	x	x	x		x
Commercial fishing	x	x			x
Fishing in breeding grounds	x	x	x		x
Intermittent fishing	x	x	x		x
Household pollution	x	x			
Industrial pollution					
Sedimentation	x	x	x		

Although the degree of these threats has not been quantified, some things seem clear:

- *Overfishing*. Threats from overfishing appear minimal. Most fishing in Rwanda is confined to lakes; there is very little in rivers and streams. Fishing remains more or less at the artisanal level; the contribution of the fishing industry to GDP is negligible (less than 1 percent in 1998). There are reports of the use of small- mesh nets on Lake Kivu and elsewhere, but ETOA team discussions with local officials in Gisenyi suggest that most fishermen have grouped together into associations and are in general respecting GOR-stipulated net dimensions. This is confirmed by Mukwaya (1998). In fact, several past projects[3] have contributed to both the production and the environmental aspects of fisheries in Rwanda (PNUD/FAO's Project for Developing Fish in Lake Kivu), and appear to have left local fishermen with a sense of responsibility.

  Some argue that fish production in Rwanda could be increased by nearly 50 percent without damaging the resource base (Gashagaza 1998). In order to increase production, the GOR has decided to privatize Lake Ihema, giving a fishing concession to a local company, Societe de Peche de Mutara (SOPEM). As part of the concession, the GOR closed all artisanal fishing in the lake in March 2002; the regulation is enforced by Akagera National Park (ANP) staff. The company is expected to begin operations in March 2003. However, discussions with the ANP Chief Conservator suggest that SOPEM may be backing out of the arrangement; no stock studies have yet been done, nor has any infrastructure for fish processing been put into place. If SOPEM does eventually initiate activities at Lake Ihema, the ETOA team has one major concern:

  - ORTPN is proposing Ihema as a RAMSAR site. While sustainable exploitation of resources like fish is permitted under the RAMSAR convention, this is predicated on the thesis that there is a sound understanding of the resource base (fish stocks), the ceiling on the allowable harvest, and a monitoring plan to ensure compliance. While the ETOA team was not able to see the concession agreement (which may provide for these elements), the GOR needs to be sure that they are in place before SOPEM begins operations.

- *Introduced species*. MINAGRI officials introduced an exotic carnivorous fish (Protopterus aethiopicus) into Lake Muhazi to control a burgeoning mollusk population. In the opinion of NUR faculty, the fish has eliminated not only the mollusk population but the indigenous fish population as well; however, there is no empirical evidence to support this hypothesis, because no studies have yet been done. There is also concern that the species may be spreading into other lakes of the Akagera system.

[3] USAID/Rwanda supported a seminar on "La Gestion et Conservation des Ecosystems Aquatiques Rwandais: Cas des Lacs Kivu and Mugesera," at which participants concluded that fish production could be increased on these lakes, although stock data for certain species was needed, as was additional information on breeding grounds. Proposals for fish culture in bays of the lakes were a major part of the proceedings.

- *Water hyacinth*. Water hyacinth is among the world's worst exotic aquatic weeds. It grows rapidly to form thick mats on water surfaces, increases swamp areas, reduces water supply, and undermines transport, hydroelectric power production, fisheries, and fish breeding. It can also affect human health by harboring mosquitoes (malaria), snails (biharzia), and snakes.

  Some 13 years ago, it was officially recognized that water hyacinth had invaded the world's second largest lake, East Africa's Lake Victoria. That lake's hyacinth infestation now extends to its uppermost point within Rwanda's Akagera River system to the headwaters of the Mukungwa River tributary, about 50 km northwest of Kigali. The Mukungwa River joins the Nyaborongo River, which merges with Burundi's Ruvubu River system near Lake Rweru, along the Burundi border, to form the Akagera River. The entire Mukungwa/Nyabarongo/Kagera river system to Lake Victoria is now infested with water hyacinth, a length of over 500 km.

A.1.2 Opportunities

- Biological methods, especially hyacinth weevils *Neochetina eichhorniae* and *N. bruchi*, have proven an effective low-cost way to control hyacinth. Rwanda has begun weevil release efforts, having established weevil rearing centers at Ruhengeri, Kararre, and Lake Ihema. Rwanda participates in the regional coordination of hyacinth management efforts through such organizations as East African Cooperation (EAC), the Lake Victoria Fisheries Organization, and the Lake Victoria Environment Management Program and through bilateral memoranda of understanding. In the past, the GOR was assisted in this effort by Clean Lakes, Inc. (CLI), with cooperative agreement funding from USAID, and through coordination of training activities and visits to Uganda and Tanzania. Weevil stocks from Uganda are the source of the weevils imported into Rwanda. However, the CLI project has now ended. The ETOA team did not have time to ascertain what effect the termination of USAID funding had on Rwanda's hyacinth control efforts.

- Research on the impact of *Protopterus spp*. on the indigenous fish population of Lake Muhazi would be useful, especially the extent to which the species may have invaded lakes in the Akagera system.

A.2 Wetlands and Marshlands

In Rwanda the term wetlands has been restricted to the large permanent swamps; the seasonal grass swamps have been generally classified as marshlands, which is equivalent to the French term *marais*.

Rwanda's wetlands are important. They act as a buffer in flood or overflow plains, reducing maximal flow rates during the rainy season and maintaining relatively high flow rates during the dry season. The wetlands, which occupy about 10 percent of the country, are comprised of three large swamps and small wetlands scattered among the country's many hills. The main swamps are Akanyaru (12,546 ha) on the border with Burundi, Kagera along the Tanzania border to the east (12,227 ha), and the Nyabarongo (24,698 ha) and Rugezi wetlands (6294 ha) to the north.

The marshland systems are the most physically and chemically heterogeneous of all the aquatic ecosystems in Rwanda. They act as sinks for silt particles and soluble inorganic nutrients and are sources of dissolved and particulate organic matter. They are in effect seasonal wetlands, with the water table near or above the lowest ground surface during the wet season. They do not have large flood plains (generally less than 200 m wide) or great length.

From a hydrological point of view, marshlands are complex, with runoff and river valleys downstream replacing seepage in the upland areas. Because they are environmentally fragile, they require that their ecological integrity be safeguarded when they are used for agriculture. The total area of marshlands in Rwanda is estimated to be 168,000 ha, of which some 94,000 ha have already been developed, mostly for agriculture and pasturage. This estimate could be much higher given that most of the areas are not under management and therefore are not captured in official statistics.

Several donor-funded activities aim to help the GOR achieve its strategic goal of revitalizing the rural economy in order to increase rural incomes, reduce poverty, and reinforce national stability. A major element of the strategy is to rehabilitate farmed marshlands.

A.2.1 Threats

Significant adverse effects are possible from with marshland rehabilitation and infrastructure development:

- Filling in certain marshlands would destroy their ecological integrity and role.
- Water, soil, and sediment would be polluted by increased use of chemicals.
- Soil fertility would be reduced by poor management of hillsides and marshlands and the intensive use of the soil without replenishing nutrients.
- Silting of canals could lead to flooding.
- Health issues could arise if the marshlands are modified in a way that is conducive to the breeding of malaria-transmitting mosquitoes (Anopheles gambiance).
- Flooding is likely downstream due to reduced retention of water in the canals; it would be necessary to increase the size of canals and construct buffer zones at intervals to hold excess water.
- There is the threat of loss of biodiversity through reduction of habitat, particularly for birds, reptiles, and amphibians.
- Soil biodiversity would also be reduced by habitat modification and loss through use of pesticides and agrochemicals, which affect soil microorganisms. This will in turn affect soil fertility, which is dependent on these microorganisms.
- Reduction in atmospheric moisture would raise ambient temperatures.
- There would be a loss of traditional materials for thatching and craft manufacture.

There are also risks associated with not rehabilitating marshland and building infrastructure:

- Without rehabilitation, the already degraded marshlands and wetlands will be further silted due to continued loss of vegetation and the resulting accelerated erosion. This would in turn result in less water retention and thus reduced flood control.
- Unsustainable land use practices on adjacent hillsides would bring increased pressure on wetland and other marginal systems due to declining soil fertility.
- The current nonsustainable uses of fertilizers and agrochemicals is likely to increase as land productivity diminishes, increasing nutrient loading and subsequent eutrophication.
- Effects would be felt downstream if water quality declines.

Given all these potential problems, a catchment or watershed approach is the best option to address the linkages of processes between hillsides and valley bottoms, and to mitigate environmental problems. Such an approach would be designed to: (i) restore the production capacity of marshlands and hillsides while enhancing other ecological and environmental benefits; (ii) limit negative effects on transboundary water resources; and (iii) conserve biodiversity in both natural and modified environments.

The main elements of a catchment approach are:

- A dual focus: stabilizing hillside agriculture through erosion control while developing the marais
- Buffer zones at intervals in the wetlands that use natural vegetation to control flow of water and reduce downstream impact, while filtering effluents from activities in wetlands and the catchment area and providing fodder for livestock and materials for thatch
- Zoning marshland areas and restricting cultivation of critical habitats for water storage or breeding habitats for wild animals.

The main benefits of using a watershed approach to rehabilitate marshlands and hillsides are: (i) restoration of soil hydration, thus increasing soil moisture; (ii) improved soil structure with increase in organic matter and no change in the water table; (iii) improved microclimates, depending on the type of crops cultivated and whether they are supported by good agroforestry practices; (iv) increased production through improved yields; (v) an increase in biodiversity in terms of soil fauna and flora and other plants and animals, especially water birds, that forage in canals and other watering points; and (vi) the possibility of an integrated agriculture of crops, livestock, and aquaculture.

That is the theory of marshland development in Rwanda. The World Bank Rural Sector Support Project (RSSP) has drawn up guidelines and a checklist of environmental issues to be considered in choosing individual community investments, as well as guidelines for all aspects of environmental analyses. Similarly, Bikwemu (undated) has set some criteria to determine which types of wetlands should be considered critical ecosystems. Although most environmental projects attempt to use these guidelines (and USAID projects have incorporated many of the

guideline elements into the IEEs[4]), the reality in the field is somewhat different. Discussions with organizations involved in marshland rehabilitation suggest that:

- The GOR concern with higher-value rice and maize in the rehabilitated wetlands has caused some farmers to neglect or lose interest in hillside improvements.

- Much of the infrastructure being used for reclamation (canals, etc.) is designed for maize and rice; it floods all farmers' fields at the same time. As most farmers have different schedules and different crops on the hillsides, many of them make their own schedules for irrigation at night, which results in irregular irrigation patterns and flooding.

- Although a catchment approach is recommended, many projects are working either on the hillsides or in the marshlands but not both. Sometimes, one project will work on the hillsides and a different one in the valleys, with no communication between the two.

- There is a major question about the long-term sustainability of the rehabilitated marshlands given that previous rehabilitation projects have not increased productivity long-term. On many sites, farmers stopped maintaining the infrastructure shortly after a project terminated and reverted to the traditional system with all its environmental consequences. Among the reasons cited for this are that the farmers felt no sense of ownership in the rehabilitated marshland and that social assessments on which to base mechanisms to ensure long-term sustainability had been inadequate.

- Although IEEs are conducted for most sites, little attention is paid to environmental monitoring. Project staff have little time for monitoring, and rarely if ever is there any local monitoring capacity. Thus, there is no way to prove or disprove the environmental impacts, nor is there a mechanism to fine-tune the rehabilitation process.

A.2.2 Opportunities

- There must be environmental criteria for choosing marshlands to be rehabilitated. Among the criteria Bikwemu (no date) recommends to determine which types of wetlands could be considered critical ecosystems are:

  - *Hydrological criteria*. These apply particularly to high-altitude wetlands and those of the volcanic region of Cyangugu. These could be considered critical ecosystems because they are the source of several rivers and act as a reservoir for river courses downstream.

  - *Biodiversity criteria*. Wetlands ecosystems shelter very specific flora and fauna; the destruction of their ecosystems can significantly decrease biodiversity. Certain

[4] In fact, Catholic Relief Services (CRS) has recognized some of these shortcomings and intends to address sounder, more integrated development principles in the upcoming mid-term evaluation (internal) of its Development Assistance Project (DAP).

endemic species are classified by CITES spell out to ensure their protection. In particular, swamps in the Bugesera and Akagera basins are considered critical ecosystems.

- *Presence of peat*. This criterion is particularly important for high-altitude swamps and those in the Bugesera basin. They are vulnerable because they are made up of unstable saturated organic matter subject to slippage.

- *Proximity to protected areas*. This criterion is especially important for the wetlands near Akagera, which harbor substantial wildlife populations.

These criteria could be further refined to provide additional guidance to projects seeking to develop marshlands.

- Front end participatory rural assessments (PRAs) or similar assessments could identify constraints to long-term ownership and maintenance of wetland infrastructures.

Again, an integrated/landscape approach is crucial. Marshland agriculture, including swamp tea production, is very vulnerable to upstream land-use decisions that accelerate runoff and cause flooding. Deforestation, expansion of agriculture into critical gallery forests and ravines, lack of terracing or of mulching for subsistence crops, and hillside water retention are all directly responsible for the increased flooding that producers of irrigated crops now face. Marshland silting and the dramatic shifting of the peat "plates" that underlie most *marais* and wetlands are reducing the area under cultivation. Operators are now faced with costly investments in water retention and drainage for the rainy season while meeting minimum water requirements during the dry season. With close cooperation from local government in delimiting critical watershed areas, there could be significant positive impacts from setting up private commercial wood fuel plantations while taking an integrated hillside-wetlands approach to marshland agriculture.

B. Lake Shore Resource

Rwanda has about 300 km of coastline along Lake Kivu where there appears to be no immediate environmental threat. Most of the hillsides above the lake are used to raise coffee, which has generally low fertilizer inputs, no run-off, and good slope stabilization. One concern, however, is that building small methane electricity platforms on the lake (see section 8.6.4) will encourage both small and large-scale enterprises and the attendant risks of pollution. At some point, the GOR will need to plan for mitigation of the environmental impacts of lakeside industrial development, complete with environmental analyses and assessment criteria.

C. Savanna and Savanna Woodland Ecosystems

Savanna vegetation at one time extended through almost half of the eastern part of the country in the provinces of Byumba and Umutara and the eastern parts of Kigali, Gitarama, and Butare. Rwanda has three types of savanna:

Grass savanna

- *Hyparrhenia collina* (on quartz soils) and *Loudetia arundinacea* on the tops of the hills
- *Hyparrhenia lecomtei* on the slopes
- *Themeda trianda* in valleys with sandy clay soil
- *Themeda trianda* and *Botrio insculpa* on vertisols

Wooded savanna

- Mostly spiny shrubs, such as *Acacia hebecladoides* and *Nefasia spp*., on alluvial soils and around lakes.

Gallery forests

- Mostly *Carissa edulis, Jasminum mauritianus, Lannea humilis, L. schimperi, L.stulhmanni* and *L. fulva*, on rocky soils.

Because the savanna region is so rich in flora and fauna, in 1934 the Akagera National Park (ANP) (267,000ha) was established, and the Mutura Hunting Reserve (64,000ha) was added in 1957. Today, because of human pressure, over-grazing, and the need to resettle returnees, the Mutara Hunting Reserve has been completely converted to agriculture and grazing, as has two-thirds of ANP. The only remnants of the natural savanna outside the ANP are in the state-controlled grazing areas of Rilima (430ha) and Karama (300ha) and in the Gako military area.

C.1 Akagera National Park

In the 1960s, ANP formed part of the Akagera-Lake Mburo ecosystem that included Uganda's Kikagati Game Reserve, Lake Mburo National Park, and the rangeland areas north to the Katonga River. To the east, the system extended across the Akagera River into Tanzania's Ibanda and Rumanyika Game Reserves. Today, this ecosystem is entirely fragmented and wildlife is found only in small, disturbed enclaves.

This part of eastern Africa has been greatly affected by massive civil war and upheavals in Rwanda over the past 40 years, and particularly within the past decade. Under the 1993 Arusha Accord, it was resolved that returning Rwandan refugees would be settled into open areas of Rwanda; the areas deemed most suitable were the ANP and the Mutara Hunting Reserve. After the genocide of 1994, resettlement became increasingly urgent. In 1997, the Mutara Reserve was degazetted and ANP area was reduced by two-thirds, to about 1,081 km^2.

Vegetation in the ANP was previously composed of seven distinct biomes:

- Gallery forests along the Akagera River in the north
- Subhumid savanna in the west
- Floodplains in the central valley

- Subarid regions with dry forests
- High plateaus
- Lakeside woodland in the south
- The swamp and lake system of the Akagera basin

The fauna is essentially east African, including species of roan antelope (*Hippotragus equines langheld*), baboon, eland, hippopotamus, impala, oribi, sititunga, topi, warthog, waterbuck, and zebra. Black rhinoceros, introduced in 1956, were thought to be extinct, but tracks and spoor have recently been sighted. Elephants were reintroduced in 1975 and giraffes in 1985. Large carnivores include leopards and, recently, a small lion population. In 1990, the fauna comprised 5 primate, 18 carnivore, and 17 ungulate species. The lake and wetland system of ANP is home to about 500 different bird species, including the rare shoebill stork (*Balaeniceps rex*).

German Development Cooperation (GTZ) estimates that the reduction in ANP area and the loss of the Mutara Reserve have resulted in a severe loss of biodiversity through the exclusion of three principal biomes: the subhumid savanna in the west; the floodplains of the central valley; and the *Acacia kirkii* gallery forest in the north. It is estimated that the total loss resulting from exclusion of these ecosystems will be 15 percent of the former tree and shrub species and 20 percent of the herbaceous species. The loss of these habitats will lead to a decline in all wild fauna species in the area. The species most severely affected are:

- The topi, which breeds in the floodplains
- All ungulates in general, because the floodplains are one of their main feeding grounds during seasonal movements
- The silver monkey, whose major habitat is the *A. kirkii* forest
- All small fauna with species-specific relationships with plant species in the abandoned ecosystems

In spite of this potential loss, tourist numbers continue to average about 400 per month. Moreover, the GOR has just awarded a management contract to a South African firm to refurbish and reopen the hotel, develop a tented camp, and begin new activities that would involve the local community.

C.1.1 Threats

The most immediate threat to the new ANP is the estimated 270,000 cattle in the region surrounding the park. Stocking density for the Umutara region, which includes one quarter of the ANP, is 0.88 cattle/ha. (Cattle populations increased significantly because many returnees brought herds with them from Uganda; between 1998 and 2002, the cattle population increased from 103,000 to the present 270,000.) In order to ensure the long-term survival of the ecosystem, GTZ has recommended a buffer zone that would include two of the three now excluded ecosystems. The buffer zone would include all water sources and grazing grounds of the central valley and a "giraffe extension" that takes into account the habitat where giraffes can be found most frequently outside the ANP. The buffer zone would be a multiple or integrated use area where wildlife protection and controlled livestock grazing would be practiced together.

However, the very small number of local and Kigali elite who own the majority of the cattle[5], who are often absentee owners, are adamantly opposed to the buffer zone concept and in fact have advocated degazetting of the park and its conversion to agriculture and grazing. The situation is exacerbated by the fact that the cattle are not high-quality meat or milk producers (nor are many even sold) but are kept as a traditional symbol of wealth and prestige. The result is that grazing pressure on the park and surrounding areas, combined with other human influences, has severely undermined the ANP's vegetation and wildlife.

Grave vegetation changes have already occurred not only through heavy sustained grazing but also because of agriculture encroachment, charcoal production, tree-cutting for firewood and construction, and deliberately set fires, which have burned large areas of the park. Inside the park, where grazing pressure is heavy, there has been a significant decrease of palatable nutrient-rich grasses and an increase in weeds. An additional problem is gully erosion, particularly along trails used by cattle.

There has also been a major decline in the numbers of animals in the park; this is attributable to the severe reduction of range and vegetation degradation from overgrazing and poaching, and this trend is continuing (see Exhibit 7.2).

Exhibit 7.2 Losses of Wildlife in Akagera National Park

Species	1990	1997-1998	Percent Change	2002	Percent Change
Buffalo	10,000	2,260	-77	491	-78
Eland	325	103	-68	114	+11
Impala	30,000	5,660	-81	1890	-67
Reedbuck	1,890	n/a	n/a	74	-96
Topi	7,500	2,020	-73	713	-65
Warthog	1,500	380	-75	383	+1
Waterbuck	1,600	350	-78	161	-54
Zebra	3,800	3,050	-20	652	-79

GTZ predicts that the rate of decline will continue due to reduction of range; increasing completion with domestic livestock; loss of habitat due to increasing vegetation changes, agriculture, and the exclusion of wildlife from water resources; and loss of access to traditional breeding grounds.

C.1.2 Opportunities

The rehabilitation of ANP would make a considerable contribution to Rwanda's tourism circuit, giving tourists coming to see the gorillas an opportunity to visit a biologically diverse variety of east African wildlife without the expense of going to Kenya and Tanzania. Before this can happen, however, the grazing issue needs to be addressed at the highest levels of government, and both donors and civil society need to bring pressure to bear.

[5] GTZ/PRORENA survey/data. During the ETOA team visit, GTZ/PRORENA was preparing a letter of protest to the minister that detailed the status and ownership of livestock in Akagera. The letter was to be circulated to organizations and local and international NGOs for supporting signatures.

D. Forest Ecosystems

D.1 Afromontane Forests

Rwanda's afromontane forests used to run the length of the Nile-Congo crest but population pressure have now limited them to the forest reserves of Nyungwe, Gishwati and Mukura, and Volcano National Park (*Parc Nationale des Volcans - PNV*).

Volcano National Park is classified by the International Union for Conservation and Nature (IUCN) as a Category II: National Park—a protected area managed mainly for ecosystem protection and recreation. IUCN defines a national park as a natural area of land or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes for which the area is designed, and (c) provide a foundation for spiritual, scientific, educational, recreational, and visitor opportunities, all of which must be environmentally and culturally compatible.

IUCN classifies the Nyungwe, Gishwati, and Mukura forest reserves as Category IV: Habitat/Species Management Areas—protected areas managed mainly for conservation through management intervention. IUCN defines this category as an area of land or sea subject to active intervention for management purposes to ensure the maintenance of habitats or to meet the requirements of specific species.

D.1.1 Nyungwe Forest Reserve (NFR)

Nyungwe Forest Reserve (NFR) is widely recognized as being of global as well as national significance. When it was designated a forest reserve in 1933, its total area was 1,141 km^2; encroachment by local farmers between 1958 and 1979 reduced the reserve area to 971 km^2. More recent information is not available but the area is thought now to be considerably less. The forests at Nyungwe are interrupted by two large permanent swamps, Kamiranzovu and Uwasenkoko. Kamiranzovu swamp, which covers approximately 13 km^2, is one of the largest peat bodies in Africa. With the destruction of Gishwati and Mukura Forest Reserves (see below), NFR is one of only two remaining afromontane components of Rwanda's protected area system.

NFR is important for conservation of several restricted-range species that are found only in the Albertine Rift ecoregion in Africa. It is home to 26 Albertine Rift endemic birds, more than any other protected area in the region; only the unprotected Itombwe Mountains contain more endemic species. NFR also contains 13 species of primate, including the owl-faced monkey (*Cercopitecus hamlynii*) and l'Hoest's monkey (*C. lhoesti*), both restricted-range species. The black and white colobus (*Colobus angolensis*) groups in Nyungwe are unusually large, ranging up to 450 individuals — larger than any other groups recorded for this species. Eastern chimpanzees (*Pan troglodytes schweinfurthii*), an endangered species, occur in Nyungwe, and IUCN classifies the owl-faced monkeys as vulnerable.

NFR is home to 1,068 recorded plant species, of which about 250 are endemic to the Albertine Rift. Among fauna, 85 mammal, 278 bird, 32 amphibian, and 38 reptile species have been recorded there; of these, 62 species are endemic to the rift. A comparison with other forests in

the Albertine Rift shows that for all taxa NFR ranks consistently high. It has more endemic species than any other rift forest that has been surveyed (about 60 percent). Thus, Nyungwe is considered a critical area for conservation of restricted-range species not only by the GOR but also by the international conservation community.

NFR's socioeconomic importance is as significant as its biological importance. Nyungwe is the watershed for over 70 percent of Rwanda; its streams feed both the Congo and the Nile basins. It thus protects a major watershed not just for surrounding communities but also for communities much further downstream. Population densities around Nyungwe are among the highest in Africa (250-500/ km^2), but the forest's tempering effect results in longer periods of rain each year, supporting a relatively high degree of agricultural production.

The buffer zone around the forest has been planted with a variety of species (*Pinus patula*, *Cupressus lusitanica*, and *Acacia melanoxylon*) and is a source of building poles and firewood for local populations. Local herbalists harvest medicinal plants in the forest and a new ORTPN program allows herbalists to harvest wildings from the forest to plant on their own land. Beekeeping associations place hives at the edge of the forest because the honey produced there is of superior quality. Tourism in Nyungwe generates a small but growing amount of direct revenue for the national park system but has a greater importance to the tourist industry as part of a larger tourism circuit.

Threats

Nyungwe faces several major threats, derived largely from the pressure of population growth on limited land resources, lack of alternative sustainable sources of income for local communities, and the limited availability and awareness of economic incentives and the benefits that can accrue from sustainable use of biodiversity.

Poaching of large mammals is high. As a result, duiker densities are very low, buffalo were extirpated early in the 1980s, and the last elephant was shot in 1999. Hunters now target smaller mammals like giant rats and squirrels as larger mammal populations decline.

Fires caused by beekeepers using fire to smoke bees from wild hives have spread, devastating large areas of forests. Fires are particularly bad during El Nino years when the climate is dryer. As a result many hills have few or no trees.

At times, mining of gold and more recently columbo-tantalite has led to creation of large mining camps in the forests, some containing more than 3,000 people, but as prices for these minerals have fallen in recent years, so has mining activity.

Finally, the disappearance of large ungulates appears to have upset Nyungwe's ecological balance. Nyungwe's elephant population preferred a certain vine (*Sericostachys scandens*). Without the elephants, the vines have grown to the extent that they are actually threatening to strangle standing trees. The absence of large ungulates also appears to have hampered forest regeneration of burned areas. Because there are no grazing animals to stem the proliferation of ferns and grasses that appear after a fire, they remain to hamper seed dispersal and germination.

Park staff say that many burned areas have remained under fern/grass cover – the first stage of succession - for many years, with little change in species composition.

Opportunities

Legislation currently before Parliament would make Nyungwe a national park. With this new classification, all human activities in the park would, in theory at least, become illegal, but the ETOA team believes that restricting the access of local people to the park may result in even more degradation. The team suggests that ORTPN take a community co-management approach to Nyungwe, permitting but controlling community access for medicinal herb collection, honey production (using improved hives), and similar activities.

At the same time, there must be community-based incentives to protect the forest. To introduce these, it is necessary to:

- Identify and remove disincentives and implement positive incentives in the form of mechanisms for appropriate distribution of park benefits. These might include expanding tourism opportunities to incorporate community-managed tourism and finding better ways for communities to manage and benefit from buffer zone forests. (AREDI is already helping a local farmers group buy and renovate a portable sawmill, and is negotiating with the GOR to lease certain areas of the buffer zone for group management.)

- Promote market-based incentives, improve hives and honey production, build on-farm capability for herb medicinals and bamboo, and teach farmers how to link crops to markets. The tea around Nyungwe is of very high quality. It could be marketed as rainforest tea if linked more closely to management of NFR. Green labeling could increase the price of the product and better link it to fair trade groups willing to pay higher prices.

- FFW programs (monetized) for in-park, public works projects (trail, road and bridge maintenance/construction, etc.), a la Civilian Conservation Corps pending development of the above activities.

D.1.2 Gishwati Forest Reserve

Founded in 1933, Gishwati Forest Reserve originally had an area of about 28,000 ha in Ruhengeri/Gisenyi provinces, running for about 25 miles along the Nile-Congo crest at between 2,000 m and 3,000 m altitude. Plant and animal species distribution in Gishwati was similar to that of Nyungwe.

In the 1980s actual forest areas was reduced to about 4,500 ha when a World Bank- funded project cleared the forest and replaced it with pasture to accommodate more than 26,000 cattle. The rationale at the time was that it was better to have a designated pasture area and a smaller protected reserve than have the cattle graze indiscriminately in the forest.

Newer GOR policies to transform Gishwati Forest Reserve, ANP, and to a certain extent Mukura Forest Reserve into resettlement areas, though they erode a natural resource, have addressed a major national point of conflict – how to settle returnee families that had been in exile for decades and found their ancestral lands occupied on their return in 1994. Under the 1993 Arusha Accords, returnees no longer had the prerogative to lay claim to land upon which they once had traditional tenure rights, yet these families were facing destitution. Use of national parks and forest reserve land was seen as a necessary compromise, despite the negative short and long-term ecological and economic consequences.

Current estimates of the remaining forest area in Gishwati are between 20 and 700ha, found mostly on inaccessible sites. The short-term consequences of removal of the forest are readily visible in the erosion on the Gisenyi-Ruhengeri road. Without the forest to slow run-off, areas of the road require almost continuous maintenance in the rainy season to clear mud and silt, and stabilize the roadbed.

Opportunities

The African Development Bank is financing a project to rehabilitate Gishwati and Mukura. Although details were not available, it is thought that this would be accomplished through enrichment plantings with natural species. As a general rule, though, enrichment plantings are costly and have proved of marginal significance in reestablishing natural forests. If enough seed trees remain or regeneration is assisted, and if the area can be protected, nature does a better job of rehabilitating natural forests than man.

Longer term, the GOR may want to develop an environmental strategy for refugee relief and other emergency activities that would: (i) ensure that both indigenous and refugee populations are part of the decision-making process for use and management of environmental resources; (ii) minimize environmental impacts; (iii) identify energy resources and attempt to mitigate their local environmental impacts; and (iv) monitor environmental impacts. Such a strategy should be part of the National Environmental Action Plan.

D.1.3 Mukura Forest Reserve

Founded in 1933 with a total area of 2,000 ha, Mukura Forest Reserve was at one time linked to Gishwati along the Nile-Congo crest. Subject to intense human pressure over the years in the form of agriculture encroachment, illegal cutting, grazing (1,000 milk producers are in the forest), and more recently returnee resettlement, Mukura has been reduced to a series of small disjointed primary forest relics in remote valleys and on steep slopes that are difficult to access. Although the ETOA team did not visit Mukura, interviews suggest that the total area left is very small and that many of Mukura's previously important plant and animal species, particularly birds, have disappeared.

Like other afromontane forests of the Nile-Congo crest, Mukura played an important watershed role for Rwanda and was the source of a number of permanent springs and streams. With the disappearance of the forest, many of these springs have apparently become seasonal. Mukura forests also acted as a sponge, absorbing excess water and preventing runoff and erosion, thus stabilizing agriculture in surrounding areas. Local residents report that this benefit has all but

disappeared; according to GOR and NGO authorities, the residents have formed an association to help reconstitute the forest.

D.1.4 Volcano National Park

Volcano National Park (PNV) has probably the longest conservation history in Africa. Its major objective was saving the last representatives of a species in course of extinction, the mountain gorilla (*Gorilla gorilla beringei*). In 1902, Captain Oscar von Beringei was the first European to observe the mountain gorilla. He and a fellow explorer spotted a group of black apes while climbing Mount Sabinyo of the Virunga Mountains. They shot two of the animals and sent them to the great German anatomist, Matschu, who said they were a separate subspecies. This started a flurry of international scientific interest that brought the death of 54 more Virunga gorillas between 1902 and 1929.

Carl Ackey, after shooting five mountain gorillas in 1929 for the American Museum of Natural History, was so impressed with the subspecies and its habitat that he urged the Belgian Government, headed by King Albert, to make the Virunga Mountains a national park. As a result, that same year Albert National Park was established as one of the first national parks in Africa, with the PNV as the Rwandan component.

Currently, mountain gorillas are found in four national parks in two forested blocks. Together they cover about 590 km^2 of afromontane and medium-altitude forest typified by high species diversity and endemism. One of the forest blocks is the Bwindi Impenetrable National Park in Uganda, which has 310 gorillas. The other is composed of three national parks: Mgahinga Gorilla National Park in Uganda, Virunga National Park in the DRC, and PNV in Rwanda. Together, these parks account for at least 358 gorillas.

Situated in the provinces of Gisenyi and Ruhengeri, the PNV lies in the Virunga Mountains, a chain of eight dormant volcanoes, of which five are in Rwanda: Karisimbi (4,507 m), Muhabura (4,126 m), Bisoke (3,711 m), Sabyinyo (3,634 m), and Gahinga (3,474 m). The current area of the park is about 15,000 ha, down from 19,000 ha (4,000 ha were given up for pyrethrum culture after Rwanda's independence).

The vegetation, which varies with altitude, is classified into four main ecotypes, only those at higher elevation remaining fairly intact:

- **The afromontane forest zone** at the foot of the volcanoes (2,000-2,900m) in general has been severely degraded into secondary forest as a result of human activity, mainly agriculture and deforestation. Only the higher parts remain more or less intact, most notably the bamboo forest (Arundinaria albina) situated between 2,600 and 2,900 m on Sabyinyo.

- The **Hageni-hypericum zone** (2,900-3,200 m) is characterized by two species, Hagenia abyssinica and Hypericum revolutum. The lack of spermatophytes is made up for in part by a notable presence of cryptogames (most notably Usnea spp.) and bryophytes.

- **Vegetation of the alpine belt** (3,200-3,500 m) reflects diurnal temperature extremes. It is composed mainly of Lobelia wollastoni and Lobelia stulhmani, with grasses (Alchemilla johnstoni), bryophytes, and lichens dominating the herbaceous strata.

- The **desert alpine zone** (above 3,500 m) is composed solely of lichens and mosses.

In addition to the gorillas, the PNV afromontane forests contain elephants, buffalo, several primates, and other mammals. CITES considers *Rana anolensis*, *Chameleo rudi*, and *Leptosiaphos graueri* endangered. The PNV has:

- 245 plant species, of which 17 are threatened—of these, 13 species of orchids are internationally protected
- 115 mammal species
- 187 bird species
- 27 species of reptiles and amphibians
- 33 arthropod species.

Given the focus on mountain gorillas, many of the other species in the park, both plant and animal, have gone more or less unnoticed. However, the International Gorilla Conservation Project (IGCP) is now working with ORTPN to habituate two groups of golden monkeys (*Cercopitecus mitis kandtii*) for tourism and has begun to collect data and monitor the monkeys.

Finally, the PNV is crucial in capturing and retaining rainfall in Rwanda. While the park only covers 0.5 percent of total area, it represents 10 percent of watershed protection. The volcanic soils in and surrounding the park are some of the richest and most productive in Rwanda; given the high rainfall, the PNV forests act as a sponge, absorbing excess water and preventing runoff and erosion, thus stabilizing nearby agriculture.

Threats

- **Poaching**. Although security in PNV has much improved since early 2002, gorilla poaching has increased, largely due to pressure from the DRC and the relatively easy movement of people across the border. On May 9, 2002 poachers attacked the Susa group and killed two female gorillas, leaving one orphan infant female, one baby missing, and one silverback injured. Through the help of informants, the prefect of Ruhengeri said, the suspects have been captured and sentenced to four years in prison.

- **Other human activities**. Human activity in the park varies by sector (there are five) but includes agriculture encroachment, wood cutting (for firewood and construction), bamboo harvesting (for construction and bean poles), water collection, antelope poaching, medicinal plant collection, and beehive placement.

Opportunities

Improved coordination. There are at least seven NGOs working in the PNV on conservation biology, with particular emphasis on the mountain gorillas: (i) the IGCP (composed of the World Wildlife Fund [WWF], the African Wildlife Foundation [AWF], and Fauna and Flora International [FFI]); (ii) the Diane Fossey Gorilla Fund International (DFGFI); (iii) the Dian Fossey Gorilla Foundation Europe (DFGFE); (iv) Berggorilla and Regenwald Direkthilfe (BED); (v) the Institute for the Tropical Forest Conservation (ITFC); (vi) the Wildlife Conservation Society (WCS); and (vii) the Mountain Gorilla Veterinary Project (MGVP). Discussions with ORTPN and NGO and other officials suggest that coordination between these organizations could be improved. As ORTPN is reorganized and a new director appointed, the ETOA team hopes that an early priority will be to provide a coordinating framework for NGOs working in the PNV to reduce duplication of effort.

Improved community benefits. Of the seven NGOs working in the park, apparently only two have any community development activities:

- The IGCP works with communities to create wildlife clubs in schools; build a para-ORTPN community defense force to help maintain park security; support a local NGO, Animateurs de la Conservation, carrying out public awareness programs; help a local beekeeping association relocate hives from inside the park to suitable locations outside; build a curio shop to display the work of artists from the Project to Promote Small and Medium Rural Enterprises; and facilitate negotiations between the commune of Kinigi and a private company, Musiara Ltd., that wants to build a high-end tourism lodge outside the park. IGCP bought the land for the site and gave it to the community, which will in turn lease it to Musiara.

- DFGFE works along the same lines to move illegal activities out of the park to nearby areas. Working through local NGOs, the foundation works on hive relocation and training (with 30 beekeeping associations); rainwater collection systems for schools and churches; microcredit for women's associations; promotion of local artists (sculpture, wood processing, and ceramics); support to the Affected Indigenous People's Organization to help the Batwa by giving them land, tools, seeds, and training in agriculture; improving farming systems; organic agriculture; and establishing wildlife clubs in local schools.

All these activities seem worthwhile enough to be continued and perhaps expanded. However, at least in the short term, they will not be enough to deter illegal activity in the PNV. The PNV management philosophy has been to exclude all human activity from the park except for controlled tourism; yet the local community has few alternatives to forest/park use (wood, medicinal plants, bamboo, etc.) and these are costly. While revenues generated by gorilla tourism are quite high, very little is returned to the community. The ETOA team strongly recommends that ORTPN consider creating a local revenue-sharing scheme that returns a percentage of proceeds to the communities to invest in resources lost because access to the forest has been denied.

D.2 Gallery Forests

Gallery forests — strips of forest along watercourses or extending from wetlands — have been significantly reduced in Rwanda due to clearing for agriculture, bush fires, and cutting for fire and construction wood. They are now found only in the east along the Akagera river system; their area is about 163 ha.

From a biodiversity point of view, the most important gallery forest is Ibanda-Makera, which contains a number of rare endemic species, including *Blighia unijugata*, *Grewia forbesi*, *Rhus vulgaris*, and *Ficus spp*. Many of these species are used in traditional medicine, and there is interest in researching their qualities for biochemical extracts and modern medicine, but commercial exploitation of these species may have negative consequences on Rwanda's remaining gallery forests if no safeguards are put in place.

E. Agricultural Land Uses

E.1 Crop Production and Farming Systems

Agriculture is the mainstay of Rwanda's economy; about 91 percent of the population depends on the sector, which is estimated to contribute about 40 percent to GDP and 30 percent to export earnings. Arable land covers about 1,385,000 ha, some 52 percent of total area. Per capita land holdings are very small, averaging 0.6 ha per family.

The main food crops are bananas, beans, sorghum, sweet potatoes, Irish potatoes, cassava, maize, and rice. Vegetable crops are mainly tomatoes, cabbages, and peas. Crop yields are generally low. Although the Ministry of Finance reported that food crop yields grew by 16.6 percent in the first nine months of 2002, the increase was due to good weather conditions rather than gains in productivity.

E.1.1 Threats

The main environmental threat to Rwanda's farming systems is erosion, stemming from the fact that most agriculture is done on slopes so steep that they occasionally approach 100 percent. Steep hillsides are likely to erode whenever protective vegetative covering is removed or the surface is disturbed; the hillsides typically suffer the least erosion in their natural state as forests or grassland. Regularly disturbing the soil and leaving large portions of it without protective covering — as happens with agricultural row crops — promotes erosion. Studies in the 1980s supported by USAID (the Ruhengeri Resource Analysis and Mapping Project) indicated that cropped hillsides lose as much as 80 to 100 m3 of soil per ha per year. These fields become infertile after only three or four years, with consequent environmental impacts downstream, including silting of streams and rivers. Given that use of chemical fertilizers is relatively rare in most traditional farming systems because of their cost and that use of organic fertilizers is limited, it is difficult to increase agricultural productivity.

Another threat is the fact that traditional tenure patterns on the hillsides have become less certain in the past years, particularly in areas with high returnee populations. Current owners are often obliged to share fields with returnees, which can cause conflict. World Vision reports that in

these cases, there is no sense of ownership of terraces and they are often abandoned after only a year, with severe environmental consequences., WV has changed its practice (based on the findings from its Transitional Assistance Project) and is establishing radical terraces only on fields close to farmers' houses where some sense of ownership is still present.

E.1.2 Opportunities

Terracing and other protective measures can significantly reduce erosion if they are well implemented and maintained. Raising perennial crops like tea and coffee that provide significant vegetative cover and do not disturb the soil can also reduce erosion. Given the large areas of steep hillside in coffee production in Rwanda, one strong rationale for supporting the coffee subsector is to maintain coffee acreage as a form of hillside protection. Bananas are also a good cover crop, though suited only to the lower slopes and valleys. If agricultural row crops were to replace coffee in Rwanda, Rwanda would shortly begin to look like Haiti.

The GOR recognizes erosion as a major problem. Its June 2002 Poverty Reduction Strategy Plan speaks of improving the environmental infrastructure by accelerating terracing, reforestation, and marsh management under the PRSP's proposed labor-intensive public works program, to be managed with the active participation of local communities. The PRSP also calls for community participation in establishing collective and individual property rights in the environmental infrastructure.

There could be no objection to environmental-related or other *true* public works programs paid by GOR resources. Indeed, in the United States many national parks as well as windbreaks across the Great Plains were established during the Great Depression by one of the most famous U.S. public works programs, the Civilian Conservation Corps (CCC). However, the team does question the practice of paying farmers to make environmental improvements like terraces on their own land.[6] Most research on the subject and discussions with organizations involved in terracing in Rwanda suggest that this is neither economically or environmentally sustainable. Economically, the cost of digging radical terraces (the preferred GOR system) on all Rwanda's hillsides would be staggering. Moreover, radical terraces that are badly maintained (as is usually the case when farmers are paid to dig the terraces, because they have no sense of ownership) can actually increase soil erosion, particularly gully erosion.

There are a number of organizations in Rwanda with considerable experience in working with farmers to establish radical terraces without paying them. In particular, the Kisaro Center in Byumba has helped to establish several farmers groups that work together to establish radical terraces on each other's fields and who jointly purchase inputs and market their produce. Similarly, the African Highlands initiative has been working with farmers on using less intensive erosion-control options without paying them, with considerable success. World Vision reports that in Butare less intensive progressive terracing has been widely replicated by farmers without any payment. The result is an economically and environmentally sustainable farming system.

[6] The ETOA team does recognize that there will be certain cases involving very poor or disadvantaged farmers where the use of FFW, etc., to establish terraces may provide the impetus required to increase agriculture production and the farmer's standard of living.

Another concern is the GOR emphasis on radical terraces. Although radical terraces can substantially increase yields through water and organic matter retention after three to four years, there are other forms of less intensive—and less costly—forms of terracing and on- farm environmental improvements, such as progressive terracing, grass strips, and other agroforestry combinations that give very favorable results. ISAR, alone and in collaboration with ICRAF, has spent considerable time and effort over the years researching and developing these systems.

The major problem is that there has never been a comparative cost/benefit analysis of these farm systems. The rate of return on radical terraces may well be lower than that of less intensive terracing systems. It may also be that different types of systems should be used on different parts of a farm: radical terraces could be used on fields close to the homestead for more intensive agriculture while other forms could be used on fields further from the house. All these concepts should be the subject of further socioeconomic analysis.

The ETOA team recommends that the GOR thoroughly study the public works concept for on-farm environmental improvements, looking at

- Alternatives to paying farmers for on-farm environmental improvements
- Cost-benefit comparisons of different terracing techniques
- Socioeconomic analysis of the use of different terracing techniques by a single farmer.

Such studies would underpin a rational, cost-effective soil conservation strategy and implementation plan for individual holdings.

E.2 Grazing and Animal Husbandry

Rwanda's main cattle-grazing areas are in the prefectures of Umutara, Kibungo, Kigali Rural, and Gitarama. Cattle and their products (milk, cheese, leather, and butter) are estimated to have contributed 4 percent to GDP in 1998.

E.2.1 Threats

Recently, cattle populations have increased to the point that rangelands are becoming severely degraded. As discussed in 8.3.1.1, herds brought to Umutara by returnees from Uganda have increased stocking density to .88 cattle/ha, on rangeland that most agree should only support one cow for every 1.5-2.0 ha. Nor are these productive cattle; they are kept as a traditional symbol of wealth and prestige.

Rwanda's PRSP calls for introducing improved livestock breeds suited to mixed farming, and the strategic placement of improved stock for breeding (village bull schemes). It will support milk marketing with collection centers and cold storage development, and provide credit to help poorer farmers buy animals. While the ETOA team believes that this strategy is appropriate for most Rwandan farms, it does little to address the problems of traditional extensive livestock systems.

E.2.2 Opportunities

- The GOR needs a strategy (and eventually policy and legislation) to address the social and environmental issues inherent in traditional livestock systems. As has been demonstrated elsewhere in East and Central Africa, this is a complicated task that will require considerable study and local participation.

E.3 Agriculture Enterprises

E.3.1 Agrochemicals

E.3.1.a Tea

Threat

Tea is intensively managed both on and off estates. It is currently dependent on large quantities of composite fertilizers, fungicides, and pesticides that can total more than 1,000 kg/ha per year. The use of this many chemicals on swamp tea, where improper application can quickly contaminate surface water, is a concern to both authorities and buyers. Record-keeping for storage and distribution of pesticides on subcontractor parcels is very questionable, as is the training and supervision of both estate staff and subcontractors growers in proper application of agrochemicals.

Opportunity

USAID and other donors should consider giving tea producers technical assistance on how to set up and maintain pesticide training records, giving systematic attention to the use and control of safety equipment for pesticide and fungicide handlers.

E.3.1.b Fresh-Cut Flowers

Export of fresh-cut flowers from East and Southern Africa has gained momentum over the past decade as land and labor prices there have made other production less competitive. Uganda, Kenya, and Zimbabwe have held prominent positions in the fresh- flower market in recent years. Rwanda has only occasionally been a player over the past decade because civil war and genocide eliminated the people, the investment climate, and the air transport options necessary to stay in this highly competitive market.

With African Development Bank support, a new entrant has reinvigorated interest in harnessing Rwanda's potential for flower production. One enterprise exports flowers — 10 varieties of long-stem, medium, and sweetheart roses - to Europe, competing directly with an estimated 23 producers in Uganda.

Threats

- **Water Needs and Groundwater Pollution**. Because fresh flowers require large quantities of clean water for drip irrigation, they must be close to water sources. Because of the high volume of water and the large quantities of agrochemicals used,

there is significant potential likelihood of surface and groundwater contamination. In Rwanda, the current exporter, like previous ones, is located on reclaimed swampland only 1 m above both ground and surface water. The production site is directly upstream from Rwanda's large rice and sugar-producing areas. This marshland is also close to Kigali on the primary water source supporting a significant and rapidly growing informal sector.

- **Agrochemical Use**. It is quite certain that excess agrochemicals of all types are leaching into the watershed. While some nearby sugar and rice producers may actually be benefiting from this seepage, the obvious nutrient loading is disrupting downstream ecology with algae blooms, eutrophication, and reduced oxygen. The ability of aquatic grasses and papyrus to cleanse the water and maintain the hydrology of these swamps has been reduced, and downstream aquaculture is threatened.

  While the technology is adequate to minimize costly over-application of chemicals, management of their procurement, handling, and application is not adequate. Blackboards in each flower shed prescribe the agrochemical cocktails to be applied, but there is no log of use that would allow any sort of trend analysis. While the application rates of fertilizers are reasonably well managed, there is no routine monitoring of the use, inventories, or procurement of pesticides; nor is there any indication of staff training in applications. Agrochemical suppliers evidently source products from many locations; dating and concentration information is usually labeled in languages neither spoken nor understood in Rwanda.

E.3.1.c Pyrethrum

Pyrethrum is an ecofriendly crop grown on Rwanda's rich volcanic and well-drained soils; it requires only small amounts of fertilizer, normally manure. The environmental threat arises in the distillation process.

Threats

Pyrethrum is distilled by a simple but dangerous blending of the ground dry flowers and the solvent hexane into a slurry that is filtered under pressure. Hexane is highly flammable. It must be carefully recycled after dissolving the pyrethrums, which are recovered through a simple refrigerated fractionating process. Hexane is also a potent neurotoxin that is metabolized in the liver. Long-term exposure through inhalation, ingestion, or skin contact can lead to permanent disabilities. Many countries are discouraging the use of hexane due to legal actions tied to worker exposure. Members of the Pyrethrum Society of Rwanda (SOPYRWA) maintain significant but poorly documented stocks of hexane in storage tanks both above and underground.[7]

The refrigeration system used to separate pyrethrums from the hexane solvent uses chlorodifluoromethane (Freon 22)—a chlorofluorocarbon scheduled to be phased out under the

[7] Leaks within the aboveground system that presented a significant fire hazard have been corrected with USAID (ADAR) support.

Kyoto Protocol and the Climate Change Convention, which Rwanda has ratified. The ETOA team found more than 1,500 lbs of this expensive and ozone-depleting chemical poorly stored with a variety of flammable materials. There were no records inventorying the quantities, purchase dates, or disposition.

Opportunities

USAID and other donors supporting agribusiness could encourage more progressive agrochemical management in several ways. Increasing the awareness of senior management of the costs, health and safety issues, and market implications through a walk-through audit would be a good start. Agrochemical inventory, procurement methods, and application management must be systematically improved through hands-on training. Clustering industries that are high agrochemical users (e.g., tea, flowers, and pyrethrum) in a tailored training course where each commodity team brings in plans to be reviewed and products that define the system would be a way to reduce costs. Teaming international consultants up with proven local consultants and making sure that the Rwandan Bureau of Standards (ORN) and the new Environmental Protection Unit are on the alert would be an extremely valuable follow-up.

E.3.2 Wastewater Discharge

E.3.2.a Coffee-washing Stations

Because depulping—"washing"—coffee is critical to maintaining quality through the final drying and roasting phases, USAID and other donors have emphasized establishing and managing washing stations. Traditionally, coffee in Rwanda has been washed and dried at the household level, limiting its competitiveness in more than basic coffee markets. With the recent inauguration of the Maraba station outside Butare, there are now two operational washing stations in Rwanda with five more to be opened in 2003: Burundi has about 130, and Kenya has 2,000.

Threats

Virtually all the most serious environmental impacts of coffee production occur at the washing site. Because the average washing station in the region can depulp 100 tons of wet fruit per season, there is the potential for increased environmental problems. High water requirements for the mechanics of washing, the substantial quantities of pulp waste generated, and the discharge of washing and fermentation water are all accentuated when production is concentrated at washing stations.

Stations must usually be located close to water sources, often in river valleys. Not only do washing stations require high volumes of clean water (50-100 m3/ton of wet fruit) that must be disposed of after washing, but the process of fermenting depulped beans requires water, though in smaller quantities, and generates an effluent much higher in simple carbohydrates and organic matter.

While not toxic to humans, both waste streams quickly reduce available oxygen in receiving waters, affecting downstream fish ponds, the fragile swamps so key to water management, and

drinking-water supplies. Both washing and fermentation waters should be recycled and perked in settling ponds before they reach surface waters. Unfortunately, recycling washing water is often not considered unless the station is actually buying water from local authorities.

The large quantities of pulp that are concentrated at washing stations can be a good source of organic matter if composted for six months to a year, but stations elsewhere have proven to be unsightly sources of air pollution, rodent infestations, and soil contamination. Stations elsewhere, not taking into account the huge amounts of waste generated (one ton of parchment coffee produces nearly five tons of pulp), have had to deal with the cost of transporting that waste elsewhere or storing it, often inappropriately. An ideally sited washing station would reduce handling, provide adequate composting areas, recycle wash water, and allow for proper perking of fermentation waste.

USAID through the ADAR, ACDI/VOCA and PEARL projects has supported design of better washing stations. Criteria for siting and management of future stations should be carefully reviewed with the help of civil or environmental engineers familiar with how washing stations operate. Siting should be consistent with the environmental framework law now moving through Parliament, which will prohibit discharging virtually any waste into wetlands or rivers; that would imply that washing water would have to be filtered and recycled and fermentation water perked.

Opportunities

Operating stations should already be doing everything possible to keep pulp from entering receiving waters if it is not recycled. Stations should accelerate the mixing of washing and receiving waters and enhance oxygenation by setting up simple cascading rock weirs during the dry season. Perking fields for fermentation water should be on permeable and well-drained soils, preferably outside floodplains. Using reconstructed wetlands for rapid uptake of nutrients and carbohydrates is an option that should also be investigated. The manual for coffee station installation and management being written by ADAR consultants should have a chapter on identifying and mitigating these problems.

ADAR intends to use its grant funds to share the cost of installing recycling systems. If entrepreneurs want ADAR help, they must respect these aspects of the design proposed by ADAR. Future construction for USAID-supported sites should be reviewed by the USAID Mission or the REDSO/ESA Environmental Officer. Ultimately, however, quality control must devolve to the GOR.

F. Energy

F.1 Petroleum Fuels

All petroleum products are imported either by truck the 1,000 miles from Mombasa or through the newly extended Mombassa-Nairobi-Kisumu pipeline. Total petroleum imports are about 95,000 tons a year (1998); fuel oil consumption in 1998 was 12,295 tons.

F.1.1 Threats

The GOR has very limited capacity to deal with spillage from truck accidents, pipeline rupture, etc.; no information is available on how often these occur or on their dimensions.

F.1.2 Opportunities

This is beyond the manageable interest of USAID.

F.2 Geothermal Energy

Research on geothermal options began in Rwanda in 1969 and there is now strong evidence that there are geothermal fields that could be developed as power sources Especially promising is the Albertine Rift region, where nine thermal sources have been identified, with a total estimated energy potential of 50–170 mw. Although analysis of the environmental threats attached to developing this resource was beyond its scope of work, the ETOA team nevertheless notes that The Business Council for Sustainable Energy (www.bcse.org) is organizing an Eastern Africa Geothermal Market Acceleration Conference, April 9-11, 2003, in Nairobi. As a means of mitigating the risks associated with assessment, exploration, and project development, and because regulatory and policy measures figure predominantly on the agenda, the team suggests that USAID support the participation of one or two GOR officials in this conference.

F.3 Wood Fuel

Rwandans depend heavily on wood fuel; this traditional fuel currently meets 90 percent of their energy needs. Rwandans used 3,510 million kg of wood fuel in 1992 (the last year for which figures are available). Most of this wood is consumed by homes, though large quantities are also consumed by a variety of commercial users, such as tea factories. Usage is not confined to the dispersed rural population: wood fuel also makes up the bulk of energy used in urban centers like Kigali.[8]

Biomass fuels are supplied by a commercial network. Though wood is not generally considered a commercial energy source, the supply of wood throughout Rwanda is monetized. The World Bank study investigated the supply of traditional firewood and charcoal in five prefectures: Kigali (divided into urban and rural), Gitarama, Butare, Ruhengeri, and Gisenyi. Exhibit 7.3 shows the origins of wood fuel consumed in Rwanda:

[8] This information is taken from a report prepared for the Rwandan Ministry of Energy, Water, and Natural Resource by the World Bank "Rwandan Energy Sector Rehabilitation Study on Safeguarding the Biomass Supply." The authors of the study conducted limited surveys throughout the country.

Exhibit 7.3 Origin of Wood Fuel Consumed

	Percent of Volumes											
	Kigali Urban		Kigali Rural		Gitarama		Butare		Ruhengeri		Gisenyi	
Type	FW*	Char*	FW	Char	FW	Char	FW	Char	FW	Char	FW	Char
GOR plantations	0.9%	0.1%	6.6%	0.2%	36.4%	0.7%	26.0%	2.3%	37.3%	0.8%	1.6%	17.0%
Private/community	92.9%	90.8%	68.8%	99.8%	63.6%	99.1%	74.0%	97.7%	62.7%	98.2%	98.4%	79.1%
Natural forest	5.6%	9.0%	24.7%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	1.0%	0.0%	3.9%
Other	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: World Bank, "Rwanda Energy Sector Rehabilitation Study on Safeguarding the Biomass Supply"
*FW = firewood; Char = charcoal

Exhibit 7.4 shows the distance and the means by which the wood is transported to market. Clearly, the biomass market is not only local but also regional.

Exhibit 7.4 Average Distances between Collection Point and Markets

Prefectures	Bicycle	Pickup	Truck	Head	Others
Kigali Urban	20.8	77.3	73.7	0.0	7.9
Kigali-Rural	13.5	15.8	14.3	6.8	5.7
Gitarama	8.6	12.4	8.4	9.7	7.5
Butare	12.7	11.1	70.0	9.7	5.1
Ruhengeri	10.3	27.1	17.1	7.9	7.3
Gisenyi	13.7	14.2	22.4	15.1	0.0
Average	13.3	26.3	34.3	8.2	5.6

Source: World Bank, "Rwanda Energy Sector Rehabilitation Study on Safeguarding the Biomass Supply"

Supply sources are fragmented. Large consumers like prisons, brick burners, or tea factories contract directly with one supplier or send their own employees out to gather wood. Very large consumers, such as the SORWATHE tea factory, are actively considering planting their own renewable harvesting areas. Smaller users like residences, bakeries, and workshops generally purchase wood on the street, at a higher cost.

The volumes of wood fuels consumed are set out in Exhibit 7.5.

Exhibit 7.5 Biomass Consumption in Kilograms

Prefectures	FW	Charcoal	Ag. Residues	Other	Total
Kigali urban	51,051	97,233	11,151	0	159,436
Kigali rural	313,944	24,720	78045	0	416,709
Gitarama	94,512	14,190	0	0	108,702
Butare	236,891	46,242	79,901	0	363,034
Ruhengeri	130,493	11,820	36,811	189	179,313
Gisenyi	217,728	31,500	15,552	2,419	267,199
Total	1,044,619	225,705	221,460	2,608	1,494,393

Source: World Bank, "Rwanda Energy Sector Rehabilitation Study on Safeguarding the Biomass Supply"

The World Bank study concluded that the major use of wood fuel in the areas surveyed was wholesale wood—sales ultimately to the residential sector. Nationwide the use of biomass as a fuel in commercial establishments like bakeries or brickmaking or in government buildings tends

to be minimal. However, in Kigali Urban, Gisenyi, and Ruhengeri prefectures, between 10 and 20 percent of biomass consumed is used by large industries.

F.3.1 Threats

The World Bank study predicts that at current rates of population growth and biomass utilization, if current energy practices do not change Rwandan wood fuel demand will reach 3,185 million kg by 2010, but the country's degraded environmental capital will be able to produce only 1,170 million kg—just 37.2 percent of Rwanda's wood fuel needs. This figure does not take into account the proliferation of small to medium scale agri-businesses that use wood for fuel, such as essential oil distillation, pyrethrum drying, and fruit juice and preserve production. The threat is that shortfalls in supply will be made up by using Rwanda's forest capital, its forest reserves and parks. Indeed, this has already happened in the Gishwati and Mukura Forest Reserves.

The study also concluded that those first affected will be rural households; major enterprises like tea factories will still be able to access sufficient fuel. Though some large industrial concerns are beginning to establish their own managed plantations, these may not be sufficient. For example, the Sorwathe tea processing facility burns 80 stères of wood a day. Tea plantations require about 1 ha of wood fuel for every 3 ha of tea. The Sorwathe tea plantation was given swampland in an area where the highlands were already heavily populated. It then expanded production by nearly 300 percent using subcontractors. Even if the original forest resources had been adequate, the 1:3 ratio would not have accommodated the wood fuel requirements of the subcontracting scheme. While the forest resources in the area were thought to be sufficient, population increases, new tea operations, the emergency resettlement of immigrants, and reconstruction after the 1994 crisis have all contributed to the current wood fuel scarcity. Although the tea enterprise recently bought and planted 250 ha of eucalyptus, that still will not meet its energy needs and its viability may be threatened by inadequate fuel. The firm is currently attempting to locate an additional 200 ha to meet current needs.

F.3.1 Opportunities

- **Tea**. No alternative fuels for tea drying will be available in the short to medium term; the predicted shortfall must be met by better methods of conservation, replanting, and increased efficiency in usage. Tea drying is done using boilers fired with wood fuel grown on either private or state-owned plantations. Medium and large drying facilities require approximately 1 ha of mature forest for each day of operation. Now competing with the construction boom needs for pole wood, tea estates are facing wood fuel shortages and increasing energy costs.

  Given the importance of drying in quality tea production, there are no realistic alternatives to wood fuel[9] and estates must immediately start planting future forests. They must also pay attention to more thoroughly drying their wood and increasing the efficiency of their boilers. Tea plantations have the opportunity to stimulate many more jobs in starting and managing forest plantations; increasing prices may

[9] The Director of the Sorwathe estate has calculated that diesel fuel would be five times more costly than firewood, and the cost of methane would almost six times higher.

eventually stimulate private growers to shift some agriculture production to forestry. USAID and other donors could work with tea estates to establish model forests that could stimulate additional employment while improving watershed management. USAID may wish to consider this "collateral industrial forestry" in its natural resources management strategic planning.

- **Shade coffee**. Shade-grown coffee can contribute significantly to local wood fuel supplies, in addition to having a positive watershed and biodiversity influence, but it remains an elusive element of Rwanda's coffee production, despite 15 years of experimentation by ICRAF and ISAR in shade tree species and planting configurations. USAID/Rwanda has already registered its full support for a shade-coffee proposal that it submitted, unsuccessfully, to USAID/Washington for funding on behalf of partners like PEARL, ACDI/VOCA and ICRAF.

- **Other agri-businesses**. With USAID support, the pyrethrum factory in Ruhengeri (Sopyrwa) has completely converted to solar drying of pyrethrum flowers, and has provided training on solar drying and materials to local growers. [10] However, many other agriculture-based enterprises still require large quantities of energy. For the most part, they use wood as the primary source of energy because it has been locally available and relatively cheap. Lately, wood fuel appears to be less readily available in some areas and businesses complain of price increases. Use of alternative fuels does not seem practical; diesel oil, for instance, would be five times more expensive. In some cases, solar drying may be a possibility, but its use by individual farmers may reduce product uniformity and quality. Some enterprises have experimented with burning peat, but the quality of the peat was so poor that it was not cost-effective, and peat harvesting would have significant negative impact on wetlands and water resources.

  USAID and other donors should work to build the management capacity of enterprises to ensure they have a plan to get the energy they need at a reasonable cost. This may involve experimentation with alternative energy sources, but may equally well focus on assuring that wood fuel can be obtained at an acceptable cost. The availability and cost of energy should be integrated into USAID's screening process for supporting agriculture-related development assistance projects.

- **Privatization of state-owned forestry plantations**. Currently, the state (Forestry Department) owns about 44,400 ha of forestry plantations and districts own another 22,900 ha. The primary species are *Eucalyptus spp*., sold for wood fuel and construction. Most of the plantations were planted with umuganda labor, although

[10] Sopyrwa has built 15,000 solar dryers at a cost of $600,000 and hopes that it will not need to use the crumbling wood-fired drying stations this year. Sopyrwa doubled what it paid farmers from 200f to 400f last year, saying it was due to the use of solar dryers. (Note: A profit-oriented enterprise would not normally pass on the profits this way, but the company still acts like a nationalized enterprise in many ways.) Last year's solar-dried pyrethrum actually contains a higher percentage of pyrethrin than the centrally dried pyrethrum of previous years. Thus, solar drying appears to increase quality as well as reduce energy costs. This increased pyrethrin percentage, on which international prices are based, was another justification for the increased payments to farmers.

some were planted with Food for Work and other forms of payment. Proceeds from sale of products from state plantations go into the National Forestry Fund, to be used for additional plantings and to cover administrative costs. Proceeds from district plantations go into district forestry funds, where, more often than not they are used to cover general district administrative costs (salaries), with little left over for additional plantings. Plantations are distributed as follows:

Exhibit 7.6. Distribution of Forestry Plantations

Province	State-owned Plantations (ha)	District-owned Plantations (ha)	Total (ha)
Byumba	2,440	244	2,685
Ruhengeri	115	1,935	2,050
Giikongoro	11,065	2,188	13,253
Kigali-Ngali	5,318	4,852	10,170
Kibuye	8,180	1,120	9,300
Cyangugu	4,598	1,332	5,391
Umutara	465	501	966
Gisenyi	4,183	2,588	6,771
Butare	4,796	3,629	8,425
Gitarama	3,175	4,499	7,674
TOTAL	**44,337**	**22,890**	**67,228**

Although these figures seem high, the reality is that more than half of these plantations were destroyed or severely degraded after 1995, and the rest tend to be very poorly managed. Thus, actual revenues are very small. Both the Forestry Department and the provinces recognize that they cannot manage and protect these resources without the assistance of local communities. The local people, in turn, treat the plantations like common property; there is no sense of ownership. ETOA team discussions with Forestry Department and provincial officials suggest that it might be time to begin to privatize some of these plantations or at least bring them under long-term leasehold management. A possible scenario would be to have Rwanda Fiscal Decentralization project and PEARL, ADAR, or ACDI/VOCA projects work with MINAGRI and MINALOC to:

- Identify potential district forests for privatizing
- Identify farmers groups in those districts to manage them
- Draft polices and implementation strategies, including leasehold criteria (e.g., at least 25 years, to encourage investment in the resource; a business plan with harvesting schedules/provision for replanting; revenue projections; and concession fees). (Note: The Minister for Forestry reports that a draft ministerial order is being prepared to address the subject. The order provides 30-year leases for groups and private individuals to manage state forests provided they can demonstrate capacity to do so.)
- Work with farmers groups to qualify them for leases and train them in forest and business management.

This could be a win-win situation for all concerned. Although districts would lose the revenues from the plantations, the loss would be more than made up by increased production due to better

management and protection, which would be reflected in the concession fees. Increased wood supplies from leasehold forests would reduce pressure on natural forests and could generate significant income for local people. The Fiscal Decentralization project is required to assist the GOR to decentralize two services; the ETOA team believes that forestry presents the best opportunity for the second service (health care has already been chosen as the first). Moreover, privatizing forestry would lay the groundwork for eventual decentralization of other natural resource-related services, particularly agriculture.

F.4 Methane Extraction

Lake Kivu in western Rwanda is home to substantial natural gas reserves. It holds about 250 billion m^3 of carbon dioxide, 55 billion m^3 of methane, and 5 billion m^2 of nitrogen, as well as numerous other trace gases. Of these gases, methane is the most important because of its commercial potential.

Methane is generated in the depths of the lake by two bacteriological processes. The bathymetric study of Lake Kivu carried out by Lahmeyer International in 1998 concluded that the maximum annual extraction per module would be 50 million m^3 (STP), given extraction hydraulics limitations. The study also concluded that up to 20 modules could be operated, with total annual production of 1 billion m^3 (STP).

This estimate is based on maximum production. If the Lake Kivu gas reserves are to be extracted in a sustainable manner, a study by Claus Tietze completed in 2000 indicates that the yearly maximum extraction would be 150 million m^3 (STP), because that is the amount the lake creates every year; extraction at or below the replenishment rate is sustainable. Tietze also concluded that no more than 25 million m^3 (STP) of gas should be extracted from each location; higher production would require the GOR to set up a system to monitor lake dynamics. Such a system would also help to determine the precise amount of gas that could be safely extracted from any particular region of the lake.

The productive basins, at more than 275m depth, are in the northern two-thirds of the lake. In Rwanda, this includes the area from the southern tip of Idjwi Island to Gisenyi in the north. (The area from the southern tip of the island to Cyangugu on the south of the lake is non-productive.)

Responsibility for the exploitation of the Lake Kivu gas resource has passed through many entities. Lake Kivu gas production was first investigated by the Belgian Chemical Union (UCB), which built a pilot plant at Keshero west of Goma in the Congo in 1954. UCB later built a pilot plant at Cap Rubona near the town of Gisenyi in 1963. This plant, originally built to operate for only 10 years, is still in operation today. It has a production capacity of between 1.0 and 1.5 million m3/year, though often the plant is offline due to maintenance problems. The gas is extracted along with pressurized water from a depth of 300m. When it reaches the surface, the natural drop in pressure causes the gas to escape from the water in a mixture that is 70 percent carbon dioxide (CO2) and 30 percent methane (CH4). The gas is scrubbed in a series of tanks to produce gas with an 80 percent CH4 content. All gas produced is sold to the Bralirwa brewery, which uses the gas to fire its boilers.

While the Cap Rubona facility has demonstrated the technical feasibility of gas production, there has been almost no scientific monitoring there. The plant's capital equipment is in very poor repair; the plant is venting both carbon dioxide and hydrogen sulfide. It is believed that any further exploitation of the gas, as well as increased production, would require substantial scientific evaluation and equipment upgrade. While several studies have been undertaken on behalf of the Rwandan government over the past 30 years, any potential developers would have to do their own studies to update the existing ones.

In the 1970s the governments of Zaire and Rwanda spearheaded the creation with Burundi of the Economic Community of the Countries of the Great Lakes (CEPGL) in the 1970s; in 1975 CEPGL was given the responsibility of developing the Lake Kivu gas reserves. In 1990, Rwanda and Zaire created a company called Socigaz to exploit the gas reserves on a commercial scale, but the effort was soon halted by the beginning of civil war in Rwanda. In 1998, the two countries signed an agreement making Socigaz the regulatory entity to control exploitation of their gas reserves by issuing permits to concessionaries, collecting royalties, and setting the standards for extraction. Thus, the GOR is committed to proceed with gas development.

Currently, the GOR, with the assistance of the World Bank, is drawing up regulations for accelerated exploitation of the Kivu gas reserves. The Oil and Gas Exploration and Development Act of 2001 will govern exploitation of the Lake Kivu gas reserves and stipulates conditions under which private companies can acquire concessions.

In August 2000, the Government of Rwanda, with the assistance of the World Bank, held a forum in Kigali to attract companies, both foreign and domestic, as potential Lake Kivu concessionaires. The result was the creation of a Rwandan company, Cogelgas, jointly owned by BCDI (the Bank of Commerce and Development and Industry) and the Bralirwa brewery. Initial capitalization of the entity is US$400,000 (BCDI US$150,000 and Bralirwa US$250,000). Its goal is to build a prototype gas recovery and power generation installation. Both the bank and the brewery have said they are not interested in being the ultimate owners of commercial gas recovery /generation facilities but are primarily interested in advancing the technology needed to exploit the Kivu gas reserves.

At the same time, the World Bank and others are pushing the idea of using an independent private power company to develop the gas reserves. Based on a recent study carried out by the World Bank, the GOR Ministry of Energy, BCDI, Bralirwa, and others are optimistic that foreign companies will participate in the plans for generating power from Lake Kivu gas.

Currently, two companies are interested in developing Kivu's methane resources: Dan and Associates (an Israeli firm) and Cogelgaz. Both have commissioned consulting firms to conduct feasibility studies. Both are interested in first establishing small (20–50 mw), modular, but expandable extraction and power generation platforms/barges to supply electricity to industries along the Kivu coast, with excess energy to be sold to the electricity grid.

A major issue is that no true environmental assessment has been carried out on methane extraction at Lake Kivu, certainly not one that has been done to accepted international standards. What has been done has been a series of technical analyses looking at the extraction potential.

F.4.1 Threats

The environmental impacts[11] from gas extraction could be significant; among them:

- Improper techniques employed to extract the methane might destabilize the equilibrium of the lake that is keeping the dissolved methane in place, which could cause the lake to release toxic volumes of this and other gases.[12] In fact, the 1989 U.S. Geological Survey study commissioned by USAID/Rwanda raised concern about the potential for a catastrophic accident if Lake Kivu methane were mined on a large scale. Additionally, because the lake is bordered on one side by Rwanda and on the other side by the Democratic Republic of the Congo, residents of both countries would be subject to health risks. Unless both countries collaborate on methane extraction, an environmental incident could increase tensions between the two countries.

  Tietze (2000) states that there is high risk of an accident if extraction is performed improperly, but the risk is negligible if the extraction system is properly designed and operated. He also provides an approach for safe extraction, specifying that: (i) extraction should be expanded incrementally; and (ii) lake conditions should be monitored to assure safety and inform appropriate design. This latter element may be problematic in Rwanda. As was pointed out in the USAID-funded energy market review, though there are no insurmountable technical risks to the anticipated scale-up from test unit to production of commercial quantities of gas, the lack of hard technical and scientific experience is not conducive to commercial development, especially as there is no local institutional or technical support.

F.4.2 Opportunities

The ETOA team recommends that continuing USAID support to methane extraction should be limited to:

- **Helping the GOR to draft environmental guidelines for methane extraction**. Currently, Rwanda law requires that companies conduct an EIA on setting up platforms, but to the team's knowledge, GOR has no guidelines for such assessments. The ETOA team believes that the best course of action would be to provide short-term technical assistance (STTA) to MINITERE in drafting guidelines and terms of reference for EIAs for the construction and operation of extraction platforms, including guidelines for monitoring both atmospheric and lake environments. The STTA should examine GOR capacity and technical support for the environmental monitoring of this type of technology.

[11] On the positive side, methane extraction might reduce emissions of potent greenhouse gases, and, as Teitze notes, might even convert Lake Kivu into a harmless, living lake.
[12] Destabilizing the lake's equilibrium would have severe consequences for the fish population.

In the future, however, given USAID's limited (and declining) resources, the ETOA team believes that it would be better in the short term to promote private sector fuelwood production and other alternative energy sources instead of methane generation, for the following reasons:

- **Cost**. Though wood fuel expenses at the residential level differ throughout the country, prices for major users are somewhat stable nationwide. Wood as fuel currently sells at about 2,000 FRW/stere and would be available at approximately 500 FRW if plantations were properly managed. The figure of 2,000 FRW per stere translates into approximately US$1 per million BTU, taking into account the additional labor and efficiency difference when wood is burned, but not the environmental impact of deforestation. This compares with a conservative estimated cost of Lake Kivu gas of US$2.83 per million BTU for gas at the extraction unit.

- **Limited substitution potential**. Gas could be used as a substitute fuel for either wood or diesel, both of which are used throughout the country. Though households and enterprises traditionally use only small quantities of wood for cooking, aggregate usage is quite high: 3,510 million kg in 1992 (the last year for which nation-wide statistics are available). While gas would burn more efficiently than wood fuel and have the added benefit of retarding deforestation, most major surveys investigating wood fuel usage have concluded that the population of Rwanda is too dispersed, economic and infrastructure development is currently too low, and the current price of wood fuel too low to make gas substitution practical. Thus, wood would continue to be the fuel of choice for the majority of Rwandans and most Rwandan SMEs for at least the intermediate term.

G. Health-Related Environmental Management

G.1 Disposal of Medical Wastes

G.1.1 Threats

Biomedical wastes are highly infectious liquid and solid wastes coming from products used in health-related diagnosis, treatment, prevention, and research. The World Bank estimates that Rwanda produces 2,780 kg of solid biomedical waste per day; its improper disposal poses serious environmental threats in terms of spreading disease and contaminating soil and water resources.

Improper waste disposal affects a wide array of people, starting with medical center patients, health professionals, and support staff. Outside of medical centers, private agents are charged with transport of general waste from which medical wastes have not been separated. There is also an informal sector composed mainly of women and children who search disposal sites for objects of utility and people who use discarded objects for domestic use. The risks of poor waste disposal are primarily from accidental wounds, HIV/AIDS, hepatitis A and B, and viral, bacterial and parasitic infections. Among the environmental impacts are air pollution from burning wastes in the open air and pollution of surface water and ground water through the leaching of liquid wastes.

A random survey conducted by Family Health International (FHI) at twelve health centers throughout Rwanda found the following:

Collection and removal organization

- All the centers used disposable needles and tubes.
- There was no systematic use of gloves during collection and transport of medical wastes.
- Four centers have taken precautions to block public access to places where wastes are destroyed.
- Only one center had taken precautions to ensure that destroyed wastes did not contact surface water or rain.
- There were wastes lying around at waste destruction sites at eight centers.
- Four sites distinguished between flammable and nonflammable wastes; inflammable objects were burned while the others were buried.
- At one center, collected wastes are placed in plastic bags and stacked on the ground near the garbage bin (near the latrines) for transport to Kigali Hospital for disposal.

Destruction of wastes

- Wastes are destroyed in incinerators at seven centers, but only three of these have proper (MOH design) incinerators in good working order.
- Wastes are burned in the open air in four centers: two use burning barrels, one uses a shallow pit, and one burns completely in the open air.
- Eight centers have holes in the ground for burying waste, but only two adequately cover the holes. At one center, the hole is near the kitchen.

The study concluded that the systems for collecting and eliminating medical wastes were very poor for the majority of centers. Most: (i) did not have functioning incinerators; (ii) did not block off public access to disposal sites; and (iii) burned wastes in the open air or simply threw them in uncovered holes. Only two of the twelve centers had satisfactory systems for collecting and disposing of wastes.

A World Bank study supports FHI's conclusions. The study found that:

- Most centers lack plans and procedures for waste disposal.
- 30 percent of centers do not have the necessary equipment to protect personnel handling medical waste.
- 50 percent do not separate medical from other wastes.
- 73 percent of centers use open air fires to burn wastes, 30 percent dump waste in uncovered holes, and only 10 percent have functioning incinerators.
- There are no private companies capable of transporting medical waste.

On a field trip to Gisenyi/Ruhengeri, the ETOA team visited a new health center (funded by UNDP) in Arusha. Its design met MOH criteria and included an incinerator, but the incinerator

was located close to a potato field, while the disposal hole was actually in the field. The incinerator appeared to have been used only once since the center was opened, and contained remnants of unburned waste. Center personnel said they had stopped using the incinerator because there was no money to buy fuel.

In general, medical and paramedical personnel are aware of the risks and take necessary precautions, even if they have not been formally trained to do so. However, maintenance personnel and caregivers tasked with the removal and emptying of waste bins and carrying waste to disposal sites know very little about the effects of poor management of medical wastes. Collection personnel, often laborers with little education, are in almost constant contact with infected wastes, and many do not have the equipment or training they need to ensure safe handling. The situation for those who take items from garbage or disposal sites is even worse. There is a clear need for a public awareness campaign to inform the general population of the risks.

Worse, there is no national strategy for medical waste disposal. The laws dealing with the subject mostly date from the colonial period and have not been adapted to today's realities. Legislation has been drafted that would mandate the use of ecologically rational procedures for collection, treatment, and elimination of medical waste; it also forbids "uncontrolled" incineration of wastes in general, but gives no guidelines for controlled incineration. Although the MOH has master plans for health center construction that include waste disposal sites and incinerators, they do not include environmental guidelines. The ETOA team is also concerned that the type of incinerators proposed in the MOH plans may not get hot enough to ensure adequate incineration.

Proper disposal of medical wastes requires the cooperation of many actors in Rwanda, from MINISANTE, which is responsible for setting health policy, to MINITERE, which is responsible for setting environmental policy, to health centers, district and town administrators, the private sector, and NGOs.

G.1.2 Opportunities

- Create a national strategy for medical waste disposal, updating legislation as needed. This should be done by MINISANTE and MINITERE together, with the active participation of other partners (health center personnel, district administration, NGOs, and the private sector).

- Draft guidelines for siting waste disposal sites at health centers; ensure that the MOH-recommended design of incinerators is adequate for proper incineration.

- Conduct a public awareness campaign on the dangers of handling medical wastes.

- Train health center personnel, particularly those charged with maintenance and disposal, on management of medical wastes.

G.2 Malaria Control

Every year the average child in Rwanda experiences three to six episodes of malaria, which is the leading cause of child mortality at 42.2 percent (including fever of unknown origin). The under-5 mortality rate is 196 per 1,000 live births and the infant mortality rate is 107 per 1,000 live births. Nearly 1,006,000 cases of malaria (124/1,000) and 986 deaths among all ages were reported by the MOH in 1999 alone. The scarcity of health centers and the lack of reliable transportation, coupled with desperate poverty, means that many cases of and deaths from malaria go unreported because people either get no treatment, self-medicate, or consult traditional healers.

The expense of treating malaria and its opportunity cost in terms of lost productivity drain household resources nationwide. A 1995 MINISANTE Knowledge, Attitudes, and Practices (KAP) study in Ngenda, a commune of Kigali prefecture, found that the average family spends approximately $0.30-$6.00 on treatment per malarial episode; the average is $1.50. Hospitalization may cost as much as $9.00 per episode. Given the frequency of malarial episodes, these costs add up significantly. These sizeable expenses, along with the spread of resistance to antimalarial drugs, are making treatment more difficult and prevention more important, yet only 29.8 percent of urban households and a mere 3 percent of rural households have a mosquito net.

USAID is supporting Population Services International (PSI) in an insecticide-treated mosquito net (ITN) project in Rwanda, operated in conjunction with the MOH's National Malaria Control Program (PNLP). The goal is to reduce the incidence of malaria-related morbidity and mortality in children under 5 and pregnant women by increasing the use of ITNs among the most vulnerable groups.

G.2.1 Threats

PSI and the USAID Regional Environmental Officer have written a detailed Pesticide Evaluation Report and Safer Use Action Plan for insecticide-treated nets that represents Rwanda's risk/benefit assessment of the use of deltamethrin (a WHO-approved synthetic pyrethroid, a soluble tablet in concentrations of 1 percent and the 25 percent available in home treatment kits). The plan also addresses issues related to the environmental, institutional, and social setting within which the insecticide is used. PSI/Rwanda is handling, storing, packaging, and disposing of the insecticide carefully and is educating the population about the product.

The environmental and human safety aspects of synthetic pyrethroid insecticides are as follows:

Environmental:

- Very easily biodegraded and photodegraded ; persists for only a short time
- Rapidly metabolized in soils and animal tissues (no build-up in individuals or food chains)
- In tests on animals:
  - No evidence of mutagenicity
  - No evidence of teratogenicity
  - No evidence of oncogenic effects

- No evidence of sensitization (allergic reactions)

Effects on Non Target Organisms:

- Very toxic to fish, frogs, and aquatic insects, crustaceans, and other arthropods
- Very toxic to honey bees
- Not very toxic to mammals and even less toxic to birds

Washing pyrethroid-impregnated nets in bodies of water should be avoided. The amount of insecticide released into streams during washing could have a pronounced, if transitory, effect on aquatic life, depending on washing practices, the amount of pyrethroid lost during washing, resultant concentrations in streams, and the toxicity of the particular pyrethroid to aquatic life.

Adverse Effects on Humans. The alpha cyano pyrethroids (cypermethrin, deltamethrin, lambda cyhalothrin, etc.) produce itching or burning sensations in some people (*skin paraesthesia*, irritation of the nerves) that lasts for only a short time. This is a reversible early indication of exposure, not a toxic effect. However, people who handle nets should be made aware of this mild symptom. Inappropriate handling or ingestion of deltamethrin during spraying or impregnating clothing has been known to cause convulsions.

G.2.2 Opportunities

Although the plan provides guidelines for use, there is no follow-up to see if the messages (box instructions, training, etc.) are being used effectively by the intended audience. There appears to be a need for a follow-up survey to judge impact and if necessary redesign messages, although this may already be happening (or being considered) under the WHO Roll Back Malaria Program.

H. Biodiversity

H.1 Status of Biodiversity

H.1.1 Species Diversity

H.1.1.a Flora

Although Rwanda is a small nation, it has a remarkable variety of ecosystems. Lush vegetation covers the shores of Lake Kivu along the border with the DRC, while there are papyrus swamps in the east and the thick bamboo forests of the Virungas in the north. Still, only 3 percent of Rwanda consists of natural forest vegetation. Though reforestation programs have added eucalyptus trees to once bare hillsides and roadsides, the scale is not yet sufficient to effectively counteract erosion.

Rwanda shelters 2,150 species of plants, although the degree of endemism is not known. The UNEP World Conservation Monitoring Centre lists eight species of trees as either threatened or otherwise of conservation concern.

H.1.1.b Fauna

Akagera National Park demonstrates the complexity and variety of animal life to be found in Rwanda. This park shelters rhinoceroses and elephants, as well as such rare species as the giant pangolin (anteater). Buffalo, zebras, hippopotami, antelope, warthogs, chimpanzees, and lions are just some of the animals that populate this diverse park.

The IUCN Red List of threatened species in Rwanda is included as Annex F of this report. (Current data on specific species can be found at http://www.redlist.org/.)

H.1.1.b.1 Fish

Rwanda has significant populations of fish, particularly in Lake Kivu, but in recent years the lake has been thought of as dead and thoughts have turned to capturing the methane gas emanating from the surface.

H.1.1.b.2 Amphibians and Reptiles

The American Museum of Natural History lists 87 species of amphibians and reptiles in Rwanda. The only reptile species listed with concern is the tortoise (*Kinixys erosa*).

H.1.1.b.3 Birds

Rwanda is one of Africa's top birding countries; an incredible 670 different species have been recorded within an area a little bigger than Wales but smaller than Belgium. Akagera National Park is known to have a remarkable selection of birdlife in its swamps and wetlands, which are among the most extensive in Africa. Along the lakes storks, egrets, ibises, plovers, sandpipers, kingfishers and herons can be found. Nearby marshes are home to red, yellow, and black papyrus gonolek, the blue-headed coucal, and the shoebill stork.

Nyungwe National Park is home to more than 275 bird species. Most alluring to ornithologists are 24 Albertine Rift endemics — birds whose range is restricted to a handful of afromontane forests between southern Uganda and northern Burundi – which include the Ruwenzori turaco, the red-chested alethe, several iridescent sunbirds, honking giant hornbills, and the great blue turaco.

Four species of birds in Rwanda are threatened with extinction: the shoebill (*Balaeniceps rex*), found in Akagera; Grauer's rush warbler (*Bradypterus graueri*), found in Volcano National Park, in Nyungwe, and in the swamps of Rugezi; the kungwe apalis (*Apalis argentea*), found in Nyungwe; and the African or Congo bay owl (*Phodilus prigoginei*) found along Lake Kivu.

H.1.1.b.4 Mammals

Rwanda contains 151 different types of mammal species, 11 of which are currently threatened and none of which are endemic to the area.

The best known species are the primates (14 to 16), most prominent among them the world's most endangered ape, the mountain gorilla (*Gorilla gorilla berengei*), found in Volcano National

Park. Others are the mountain monkey (*Cercopithecus hoesti*) in Nyungwe National Park, the chimpanzee (*Pan troglodytes*) in Nyungwe and the Natural Forest Reserve of Gishwati, and the golden monkey (*Cercopithecus mitis kandti*), found at certain altitudes in Volcano National Park.

Rwanda shelters 15 species of antelope, most of them in Akagera National Park. Nyungwe is inhabited by several species of duikers, including the yellow-backed duiker (*Cephalophus silvicultor*), which was threatened by extinction early in the 1900s under the pressure of intense hunting.

About 60 African elephants (*Loxodonta africana*) are thought to live in Akagera National Park. The park held a small population of the critically endangered black rhinoceros (*Diceros bicornis*) before the war but their current status is not known. The African hunting or wild dog is another Rwandan species that is currently endangered.

H.2 Principal Threats to Biodiversity

The majority of the threats to biodiversity have already been addressed; they are summarized here.

H.2.1 Human Influence

According to a 1994 report by WRI, 66 percent of the land area in Rwanda has a high degree of human disturbance and the remaining 34 percent has a medium degree. No piece of land has remained undisturbed. It is safe to say that since 1994, with the influx of more displaced persons and an increase in the struggle for arable land, the percentage of high disturbance has increased.

Deforestation was estimated at 2.3 percent per year between 1980 and 1990. In 1990, the amount of land covered by forest was as high as 7,420 km^2, 28 percent of the land surface in Rwanda. The decrease in forest surfaces from 1990 to 1995 is presented in Exhibit 7.7.

Exhibit 7.7 Loss of Forests in Rwanda, 1990 to 1995

Place	1990 (ha)	1995 (ha)	% Loss
Nyungwe Natural Forest	97,000	94,500	2.57
Volcanoes National Park	14,000	12,760	8.85
Akagera National Park	241,000	220,000	8.70
Mutara hunting reserve	34,000	20,000	41.17
Gishwati Natural Forest	8,800	3,800	56.80
Mukura Natural Forest	2,000	1,600	20.00
Wooded lots and savannas	50,000	30,000	40.00
Plantations	295,200	225,000	23.78

Forested areas continue to decrease: Nyungwe has lost more than 1,000 ha, Akagera lost more than 50 percent of its area, Mutara no longer exists, and Gishwati has practically ceased existing as a forest reserve.

The reasons for the loss in protected areas are both traditional and a reflection of the economic situation. They are linked to an increase in the Rwandan population, resulting in increased clearing of land for cultivation and firewood and increased grazing and poaching of wildlife for both consumption and sale. [13] Poverty and the lack of alternative opportunities for generating income also contribute to loss of biodiversity.

The damage to protected areas was exacerbated by fighting in Akagera (1990-1991) and Volcano (1991-1993) national parks. The war also displaced large numbers of people, who formed refugee camps that absorbed enormous quantities of firewood and caused substantial pollution. Repatriation of these refugees has consumed resources in the reconstruction of destroyed homes and buildings, as well as construction of new prisons.

Fires, either intentional or natural, have significant impact. From June through September; in particular, the Nyabarongo and Nyabugog valleys are subject to intense bushfires. Hundreds of hectares of Nyungwe Forest Reserve have also been destroyed by beekeepers using traditional methods.

The introduction of exotic species, particularly water hyacinth, is also undermining biodiversity. The entire Mukungwa/Nyabarongo/Kagera river system to Lake Victoria is now infested with water hyacinth, a length of more than 500 km. The introduction of an exotic carnivorous fish (*Protopterus aethiopicus*) into Lake Muhazi to control a burgeoning mollusk population may be reducing fish populations in the lake and perhaps elsewhere.

Finally, it is impossible to separate population, economic, and resource issues from political ones. A well-ordered public-welfare-oriented society with an appropriate policy and regulatory environment allows for decentralized management of resources and encourages private initiative to achieve equitable distribution and use of natural, social, and political resources. Rwanda unquestionably could come to grips with its resource limitations by focusing on sustainable intensification and equitable access to resources.

H.2.2 Legal and Institutional Causes

There is a general lack of incentives to conserve biodiversity, particularly for communities surrounding protected areas. Although there are a number of community development activities around the protected area system, their impact in terms of reducing loss of biodiversity is minimal. Revenue-sharing schemes where a percentage of proceeds from tourism in protected areas is returned to the communities for investment in activities lost as a result of denied access to the forest are needed.

Weak GOR management of protected areas is also contributing to biodiversity loss. Overlapping mandates, lack of equipment and resources, lack of qualified personnel, particularly on-site, weak collaboration between ORTPN and local administrations, and minimal enforcement of the laws are the major factors.

[13] Buffalo, gazelle, antelope, warthog, porcupine, and partridge populations are particular targets of poachers.

H.2.3 Natural Causes

Erosion and landslides, drought, floods, and disease also undermine biodiversity, as does the proliferation of competitive species. Drought exacerbates the grazing situation in Akagera as herders are forced to move their herds from Mutara closer to or into the park during the dry season. The absence of large ungulates in Nyungwe forest appears to have upset Nyungwe's ecological balance. In the absence of elephants, the vine they preferred is threatening to strangle standing trees. The absence of large ungulates also appears to have hampered natural succession/forest regeneration on burned areas. Meanwhile, the disease *Cinnera cupressis* destroyed hundreds of hectares of cypress plantations in the 1990s, while caterpillars devastated pine plantations along the Nile-Congo crest in 1998.

H.3 Conserving Biodiversity

H.3.1 Protected Areas

More than 12.42 percent, 3,270 km^2, of Rwanda's territory is either totally or partially protected (see Exhibit 7.8). The three main conservation areas are

- Volcano National Park in the northwest, which protects the Rwandese part of the Virunga Volcanoes, and is best known for its population of mountain gorillas
- Akagera National Park in the east, which is dominated by savannah and wetlands, and protects big game species characteristic of such habitats
- Nyungwe National Park, the largest conservation area in the country, a 970 km^2 tract of rainforest with one of the highest biodiversity levels in Africa.

Exhibit 7.8. WICE Park and Nature Reserve List

WICE PARK AND NATURE RESERVE LIST					
Name	**IUCN category[14]**	**Size (hectares)**	**Location**	**Date**	**Type**
Akagera	II	250000	1¸45'00S – 30¸38'00E	1934	National Park
Volcans	II	14000	1¸28'41S – 29¸30'43E	1929	National Park
Cyamudongo	IV	300	2¸34'00S - 28¸59'00E	1933	Forest Reserve
Gishwati	IV	6100	1¸47'00S - 29¸23'00E	1933	Forest Reserve

[14] The IUCN has defined protected area management categories based on management objectives. The two categories into which Rwanda's protected areas fall are:

- **Category II: National Park:** protected area managed mainly for ecosystem protection and recreation. **Definition:** Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
- **Category** IV: Habitat/Species Management Area: protected area managed mainly for conservation through management intervention. **Definition:** Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.

Mukura	IV	2000	1¸59'00S - 29¸31'00E	1933	Forest Reserve
Nyungwe	IV	90000	2¸30'00S - 29¸14'00E	1933	Forest Reserve

Source: IUCN (1994). Guidelines for Protected Areas Management Categories. IUCN, (Cambridge, UK and Gland, Switzerland: IUCN)

H.3.1.a Akagera National Park

Now disappearing, the Akagera game reserve is being encroached on by both migrating people and cattle. Akagera contains an African savannah landscape of tangled acacia and brachystegia bush, interspersed with patches of open grassland and a dozen swamp-fringed lakes that follow the meandering course of the Akagera River. It shelters herds of elephant and buffalo as well as the other big game animals like lions and leopards. It is inhabited by the usual savannah animals, including the spotted hyena, giraffe, zebra, and more than a dozen types of antelope, among them the impala, the oribi, the bushbuck, the tsessebe, and the world's largest antelope, the Cape eland.

H.3.1.b Volcano National Park

As part of the Virunga Volcanoes, this important park serves as home to the world- renowned mountain gorilla. Of the fewer than 300 mountain gorillas believed to still survive in the wild, half reside in Rwanda. Four groups ranging in size from 7 to 33 individuals are tracked for conservation and ecotourism efforts.

H.3.1.c Nyungwe Forest Reserve

With its national park status pending, Nyungwe extends for almost 1,000 km^2 and is the largest section of afromontane forest remaining in East or Central Africa. It lies at of elevation of between 1,600 m and 2,950 m.

Nyungwe's diverse flora and fauna include at least 200 different types of tree, along with hundreds of flowering plants, among them wild begonia, more than 100 species of orchid, and sensational giant lobelias. Of the large mammals, primates are the most visible, with 13 recorded species representing 25 percent of the African primate checklist. Of particular interest are the *Angola colobus* and an estimated 500 chimpanzees. Other primates inhabiting the park are L'Hoest's and vervet monkeys, olive baboons, grey-cheeked mangabeys, and red-tailed monkeys.

Since 1994, the southeast corner of the reserve is being fragmented by agricultural activities.

The Gishwati and Mukura Forests have been all but lost. The Gishwati reserve was the second most important area of afromontane forest in Rwanda before 1994 but has been reduced to 200-400 ha of scattered forest remnants due to the GOR's need to resettle returnees after the war. Mukura has suffered a similar fate.

H.3.2 National Strategy and Action Plan for Conserving Biodiversity

After ratifying the Biodiversity Convention, the GOR drafted a National Strategy and Action Plan for the Conservation of Biodiversity (2000). The plan analyzed the status of biodiversity in Rwanda and threats to biodiversity and proposes a series of objectives and strategies and an action plan to address the threats. The objectives and strategies are outlined below with brief team comments on status/progress (or lack thereof) are presented below.

H.3.2.a Objectives and Strategies

Objective 1: Develop and implement management plans for each protected area and wetland.

- Build institutional capacities and strengthen human resources in protected area planning a management.
  Status: IGCP, WCS, and GTZ are making significant progress in strengthening ORTPN national and local capacity. Restructuring ORTPN into two agencies, one for conservation and one for tourism, will further support this objective.

- Draft a management plan for each protected area.

  Status: Plans are completed for Volcano, nearly competed for Akagera (GTZ), and in process for Nyungwe (WCS).

- Draft a management plan for each wetland.

  Status. In process. The WB/GEF Integrated Protection and Management of Critical Ecosystems Project will draft management plans for the Akagera, Rweru-Mugesera, Urugezi, and Kamiranzovu wetlands.

Objective II: Reinforce the protected areas network

- Recruit, train, and refresh skills; provide equipment; and motivate personnel working in protected areas and wetlands, as needed.

  Status. Continuing. IGCP, WCS (with its new GEF project), and GTZ provide material support and training.

- Mark the boundaries of protected areas and wetlands.

  Status. There has been some progress in Volcano and Akagera parks, but little progress elsewhere. The Nyungwe forest boundaries need to be determined before they can be marked (this is part of the WCS GEF proposal).

- Create a buffer zone between local communities and protected areas and wetlands.

  Status. In Akagera, GTZ and ORTPN have defined the buffer zone but there is considerable resistance to this concept by the local population.

- Strengthen partnerships between local administrators and other interested groups.

  Status. There has been excellent progress in Volcano, where there is good collaboration between the prefect and ORTPN.

- Strengthen regional cooperation for protected areas and wetlands.

  Status. There is excellent cooperation between Rwanda, DRC, and Uganda on gorillas through the IGCP and some cooperation on harmonizing their EIA legislation. There is limited collaboration with Burundi on Nyungwe via the WCS.

- Discourage poaching by increasing the presence of tourists and guides in protected areas.

  Status. Because security has improved , gorilla tourism is on the increase. The OntheFrontier tourism master plan will add Nyungwe to the primate circuit.

Objective III: Increase the involvement of surrounding populations in conserving protected areas and wetlands.

- Work to better the quality of life for nearby populations to decrease pressure on protected areas and wetlands.

  Status. IGCP has been particularly effective in this regard, working with wildlife clubs, NGOs, beekeepers, artists, and other entrepreneurs. DFGFE works along the same lines to get illegal activities out of the park. WCS is undertaking some activities in Nyungwe, and plans more when the GEF proposal is approved). AREDI is working with a local farmers' group on sawmill renovation and is negotiating a contract for local harvesting of buffer zone plantations.

- Promote public education and awareness.

  Status. NGOs have undertaken relatively small-scale awareness programs but they are often not targeted to specific protected areas. There appears to be no national program.

- Put in place conflict resolution mechanisms.

  Status. There has been limited progress, generally informal.

- Provide monetary incentives to communities that contribute the most to protect, conserve, and manage protected areas and wetlands.

  Status. Progress has been limited. Several consultants and groups have recommended that ORTPN adopt a local-community revenue-sharing scheme but this has not yet

been done. The prefect of Ruhengeri is starting a small award scheme for local schools (biodiversity related poster, art contests, etc.).

- Promote and quantify Batwa indigenous knowledge in biodiversity conservation.

  Status. Diane Fossey Gorilla Fund/Europe does some work with the Batwa, but otherwise progress has been limited.

Objective IV: Develop ecotourism in a manner that supports conservation.

- Promote tourism in order to increase revenues and motivate decision makers and politicians to support conservation.

  Status. OntheFrontier is currently drafting a tourist master plan that includes PNV and Nyungwe.

- Increase international media attention to protected areas and wetlands to promote tourism.

  Status. In process, as part of the tourism master plan.

- Develop an ecotourist infrastructure.

  Status. There are few facilities in Nyungwe and PNV to house tourists, eco or otherwise. OntheFrontier recognizes this as a major stumbling block to ecotourism development and is seeking investors to develop facilities. Musiara Ltd. is building a high-end lodge near PNV and there are rumors that another safari company is interested in establishing a high-end tented camp there, but no rumors on anything for Nyungwe. A South African company has recently purchased the Akagera lodge and will begin renovations, but Akagera is not on the circuits proposed by OntheFrontier.

- Develop tourism circuits that incorporate ecovision and folklore.

  Status. As part of its tourism master plan OntheFrontier is designing a cultural circuit in addition to the primate circuit.

- Create regional tourist circuits.

  Status. No information is available on this.

- Negotiate preferential tariffs with tour companies, etc.

  Status. No information is available.

- Design a program to monitor tourism impact on the protected areas.

Status. To the best of the ETOA team's knowledge, OntheFrontier has done little work on this.

Objective V: Undertake research oriented to conservation and management of biodiversity.

- Identify research themes leading to better management and conservation of protected areas.

  Status. Progress is limited.

- Set out a research policy that prioritizes research themes and encourages research organizations to address them.

  Status. Progress is limited.

- Create a research cadre on biodiversity to better coordinate research activities and results.

  Status. The NUR Environmental Research Coordination Unit composed of the departments of biology, agronomy, geography, and economics is a good start. Its purpose is to better coordinate environmental research, place existing programs in perspective, avoid duplication, and provide a better framework for multidisciplinary research.

Objective VI: Improve institutional, juridical, political, and human resource cadres to assure better management and conservation of protected areas and wetlands.

- Pass and implement a biodiversity law.

  Status. There is no information available on this.

- Pass a law that allows for sharing the revenues from exploitation of natural resources with surrounding communities.

  Status. No law has been drafted and there appears to be lack of interest and political will to prepare one.

- Make the Nyungwe Forest Reserve a park to better protect biodiversity.

  Status. The law should be approved by mid-2003.

- Create a conservation cadre for wetlands and aquatic resources.

  Status. One of the components of the Integrated Protection and Management of Critical Ecosystems Project is to reinforce human and institutional capacity for the decentralized management of wetlands.

H.3.3 Biodiversity Protection and Management Outside Protected Areas

Status. In general, other than wetlands, there has been very limited progress in dealing with ecosystems outside of the protected areas.

Objective 1: Inventory natural and modified ecosystems outside of protected areas.

- Identify natural and modified ecosystems outside of protected areas.
- Describe those ecosystems.
- Set priorities for protecting ecosystems outside of protected areas.

Objective II: Establish management systems for each area.

- Draft management plans for each ecosystem.
- Promote comanagement of biological resources.
- Increase popular awareness of the importance of biodiversity.
- Help local community entities to manage biological resources.

Objective III: Improve institutional, juridical, political and human resource cadres to assure better management of the biodiversity of natural and modified ecosystems outside of protected areas.

- Design a system to motivate communities to conserve and manage biological resources.
- Identify priority research themes for the sustainable management of biodiversity.

H.3.4 Institutional Development

Objective I: Develop an institutional cadre for biodiversity.

- Evaluate the capacities of institutions charged with managing protected areas.

  Status. IGCP has completed an institutional analysis of ORTPN in the context of restructuring.

- Establish a coordination center for biodiversity

  Status. Progress has been limited.

- Establish a national biotechnology institution

  Status. Progress has been limited.

Objective II: Strengthen juridical cadres in biodiversity

- Evaluate current laws related to biological resources.

  Status. Some work has been done ad hoc in terms of harmonizing proposed legislation with biodiversity concerns, but there has been no concerted effort to conduct this work.

- Update ministerial mandates and ensure coordination on biodiversity conservation.

  Status. This should be a priority for the GOR, but there has been little progress.

I. Rwanda's Recent Conflict And Environmental Scarcity

Although any detailed analysis of the relationship between the recent conflict in Rwanda and the environment is well beyond the scope of this assessment, the team believes that some mention needs to be made of it.

There are two schools of thought on the issue. The first claims that environmental and demographic factors were powerful forces behind the recent civil violence in Rwanda, in that environmental scarcity was used as a political tool to incite rural populations to violence. This group maintains that the genocide in Rwanda was directly tied to political aspirations and fears, fueled by a deteriorating natural resource base; in other words, environmental and population pressures produced social stress, which resulted in violent conflict.

The second school of thought maintains that even before the violence environmental degradation and population growth were critical issues in Rwanda, clearly threatening the welfare of the general population. This group claims that environmental degradation and high population levels contributed to migrations, declining agricultural productivity, and the weakening of the legitimacy of President Juvenal Habyarimana's administration, but that many factors were operating in this conflict, and environmental and population pressures had at most a limited aggravating role.

SECTION VIII

Priorities for Improving Environmental Management

This analysis identified two major threats to environmental management in Rwanda:

- Unsustainable use of renewable natural resources
- Failure to implement policies

To begin planning and managing the environment more sustainably, the GOR will need to effectively address and mitigate these threats, and the underlying causes of environmental degradation in Rwanda: increasing poverty, population growth and migration, and political and institutional constraints. In this section, the ETOA team identifies priorities for action to improve environmental management and governance through policy and legal reform, institutional strengthening and capacity building, economic incentives, regulation and enforcement, and research.

A. Policy and Legal Reform

Rwanda's environmental resources were unavoidably affected by the numerous humanitarian calamities of 1994 and after. Since 1996, as part of its longer term vision for the country, the GOR has put considerable effort into drafting policy papers and strategies to address Rwanda's environmental concerns — but few of these new policies and strategies have been ratified and implemented. This needs to be done, and certain new strategies need to be put in place. It is critical for resource mobilization that GOR detail concrete programs and timetables, with effective monitoring and evaluation mechanisms. The following are of particular concern:

- **Land tenure**: Traditional land tenure systems appear to be breaking down in some areas of Rwanda due to resettlement of returnees; because traditional owners are obliged to share fields with returnees, tenure arrangements have become very unclear. Yet farmers need some security of tenure as a motivation to invest in environmental improvements like terracing. The GOR is currently drafting a land law, but while consultation is said to be taking place, many NGOs involved in rural development and civil society activities have not actually seen the draft policy or law. Thus, there is an urgent need to expand consultation to obtain widespread input from local populations, NGOs, and others at the grassroots before basic policy decisions are reached.

- **Mitigation strategy**. The GOR should consider developing an environmental strategy for refugee relief and other emergency activities. Much of the degradation of Gishwati and Mukura Forest Reserves could have been prevented if international agencies (especially UNHCR) and the GOR had worked together to mitigate the effects of resettlement on the environment. A sound strategy would: (i) ensure that both indigenous and refugee populations are involved when decisions are made about use and management of environmental resources; (ii) integrate environmental

concerns into emergency activities to minimize their environmental impacts; (iii) identify energy resources; and (iii) monitor environmental impacts. Such a strategy should be part of the National Environmental Action Plan.

- **Settlement sites**. As a basis for regulatory guidelines for siting new villages, Rwanda needs a comprehensive evaluation of existing settlement sites and further research on the general environmental impact of creating new villages. Successful programs that have involved villagers in such environment-friendly actions as tree planting, erosion control, and woodlot development should be replicated. Environmental education and outreach should be a standard component of settlement policy. EIAs should be mandatory in planning for future village sites.

- **Agriculture and the environment**. The potential negative effects of increased fertilizer and pesticide use in Rwanda will vary depending on the production techniques used. These could potentially be very serious in areas that are already intensively cropped and in wetlands. Given the risks of the increased use, and possible misuse, of chemical fertilizers and pesticides, a risk mitigation strategy it is imperative. Training, information, and monitoring should be fully supported by comprehensive GOR regulations on the use of chemicals in agriculture. (See Section 6.2.3 for a description of the laws that will be needed.)

- **Traditional livestock grazing strategy**. The GOR needs to a strategy (and eventually legislation) to address the social and environmental issues inherent in traditional extensive livestock systems. As has been demonstrated in other parts of East and Central Africa, this is a complicated task that will require considerable study and local participation.

- **Akagera National Park**. The rehabilitation of ANP would make a considerable contribution to Rwanda's tourism circuit, significantly broadening opportunities for tourists to explore a biologically diverse part of the east African wildlife, but first the grazing issue needs to be addressed at the highest levels of government.

- **Wetlands legislation**. The GOR needs to move as quickly as possible to finalize and pass the proposed wetlands policy and legislation. The law should provide guidelines for selecting wetlands and take an integrated watershed approach that addresses hillside agriculture and wetlands development together.

- **Privatization of national and district forest plantations.** The GOR needs to continue to develop polices and implementation strategies, including leasehold criteria, for the privatization of national and district forest plantations; the draft *Arrêté Ministeriel* currently being prepared by MINAGRI which would provide 30-year leases for groups and private individuals to manage state forests providing they can demonstrate capacity, needs to be finalized as soon as possible.

Finally, the ETOA team believes that more effort should go into strengthening Parliament, which is critical role to a strong legal and institutional framework for environmental protection in

Rwanda. In 1999, a Parliamentary Commission on Agriculture, Habitat and Sanitation was created. The work of this Commission should be backed with appropriate technical support.

B. Institutional Strengthening and Capacity Building

UNDP's Common Country Assessment identified four areas where national environmental capacity needs to be strengthened: (i) policy development and assessment; (ii) enforcement of regulations; (iii) multisectoral coordination; and (iv) research and data collection. While a complete institutional analysis of the environmental sector in Rwanda is beyond the scope of this report, the ETOA team identified several critical issues to be addressed:

- **Improve coordination at the national level**. Coordinating mechanisms are needed to ensure a comprehensive and cohesive approach to environmental management. Components of the environment portfolio are now split up among several ministries, which causes redundancy of programs and the resulting waste of scare resources. It is therefore critical that the national environmental law be passed and the Rwanda Environmental Management Agency (REMA) established as soon as possible. REMA would also have a technical arm tasked with conducting environmental assessments. One of REMA's first tasks of REMA should be to update and clarify the environmental and biodiversity mandates of the ministries.

- **Improve coordination at PNV**. At least seven NGOs are working in the PNV on matters pertaining to conservation biology, especially the mountain gorillas, with particular emphasis on conservation biology. Discussions with ORTPN, NGO, and other officials made it clear that coordination between theses organizations could be improved. One of the first priorities of the new director of ORTPN should be to provide a coordinating framework for NGOs working in the PNV in order to reduce duplication of effort.

- **Improve coordination with partners**. Given the diverse array of partners it has in the environmental sector, the GOR needs to design mechanisms to enhance information sharing and the coordination of programs and activities.

- **Strengthen ministry capacity**. There is a clear need to strengthen capacity in ministries to ensure that environmental and biodiversity concerns are consistently integrated into policies and strategies, particularly with regard to agriculture, food security, health, resettlement, water and sanitation, population, gender, industrialization, education, urban planning, poverty reduction, and regional cooperation.

- **Decentralize environmental management**. Although the GOR has made progress in this area for other sectors, a considerable amount of work needs to be done to decentralize environmental management. It is critical to:

- Define competencies and institutional mechanisms for decentralization, with particular attention to the relationship and overlapping mandates of MINITERE and MINAGRI
- Examine closely the links between land tenure and environmental management
- Analyze financial mechanisms to support decentralized environmental management
- Pass and implement the draft national environmental legislation and establish provincial, district and urban/town environmental committees to help with environmental protection and management and encourage the active involvement of the people in environmental activities.
- Inventory best practices for decentralized environmental management
- Strengthen the skills local staff in provinces, districts, sectors and parks/protected areas, particularly in formulating development plans, environmental awareness, and community participation
- Publish a guide on decentralized environmental management.

C. Economic Incentives

All of the community development activities at PNV and those at or proposed for Nyungwe seem worthwhile and should be continued and in some cases expanded, but the team believes that in the short term their benefits will not be sufficient to deter illegal activity in the parks. The management philosophy in the PNV (and possibly Nyungwe) has been to exclude all human activity from the park except for with the exception of controlled tourism, but community options for alternatives to park use for wood, medicinal plants, bamboo, etc. are very limited and costly.

At the same time, revenues generated by gorilla tourism are quite high. OntheFrontier is projecting significant increases in tourism over the next several years from proposed high-end primate and cultural ecotourism circuits. The assumption is that this type of ecotourism will increase local employment and provide opportunities for local people to sell produce, put on cultural events, etc. – good but often elusive concepts in reality. Should the numbers of tourists increase as projected, tourist revenues may exceed those from coffee and tea. Currently, however, no tourism funds are returned to the communities as an incentive to protect the parks. The ETOA team strongly recommends that ORTPN consider a local- community revenue-sharing scheme where a percentage of proceeds are to be returned to the communities for investment in activities lost as a result of the access to the forest that is denied them.

D. Regulation and Enforcement

While Rwanda has made considerable progress in establishing the strategic, policy, and legal frameworks for improved environmental management, additional gains could be made by effectively enforcing existing laws. The general lack of enforcement undermines environmental management and protection. The problem arises because the institutions responsible for enforcement are weak. However, changing Rwanda's enforcement capability will require more than just capacity building; it will require the political will to see that regulations are enforced. These types of changes are long term and require raising the awareness of a wide range of

stakeholders (e.g., resource users, judges, etc.) of the interrelations of environment, economics, and health.

E. Environmental Education and Awareness

Increasing environmental awareness is a critical long-term strategy of behavioral change to support sustainable environmental management. Although Rwanda has a number of awareness programs, most often implemented by NGOs, the general public in Rwanda is still often unaware of the environmental consequences of their actions. Environmental awareness programs in Rwanda need to be strengthened at both the national and local levels.

At the national level, more coherent strategies are needed, with particular attention to highlighting practical everyday linkages, such as those between environment and health. There must be a greater push to involve key partners, such as the churches, the media, primary school teachers, and community leaders.

At the local level, targeted social marketing with select environmental messages centered on Rwanda's protected areas can help fill the awareness gap and promote behavioral change. These site-level awareness programs could include:

- Regular press releases and newsletters—a key activity because media coverage of biodiversity issues in Rwanda has so far been limited.
- Biennial meetings of concerned NGOs and other groups
- Educational packages for primary schools
- Park food-for-work public works programs
- Internships for students, researchers, and NGO staff
- Award programs targeting members of local communities who demonstrate commitment to conserving biodiversity

F. Research and Information

Key areas for GOR attention are to:

- **Identify research themes leading to better management and conservation of protected areas**. While the following list is in no way meant to be exhaustive, the topics listed seem particularly important in addressing current needs:

  - A study of the public works concept for on-farm environmental improvements, looking into:
    - Alternatives to paying farmers for on-farm environmental improvements
    - A cost/benefit comparison of terracing techniques
    - A socioeconomic analysis of the use of different terracing techniques in different parts of a single farm

    The ultimate goal of such research would be to a rational, cost-effective on- farm soil conservation strategy and implementation plan.

- Research on succession ecology in Nyungwe to determine how the absence of ungulates has affected natural regeneration in forests and ways to emulate natural regeneration/succession in their absence.

- Research on the impact of *Protopter spp*. on the indigenous fish population of Lake Muhazi the extent to which the species may have invaded other lakes in the Akagera system.

- **Draft a research policy that prioritizes needed studies and encourages research organizations to address them**.

- **Create a research cadre on biodiversity to better coordinate research activities and promulgate results**. The creation of the NUR Research Coordination Unit is a good start to achieving this objective. The team recommends that the GOR consider formalizing this unit and mandating that it develop research policy.

- **Improve access to environmental information**. Effective environmental management is predicated on the ability to make informed decisions. This in turn requires that data be systematically collected and made available to decision makers. Rwanda lacks a systematized approach to collecting and managing environmental data. Although NUR faculty and specialists at ISAR, KIST, and elsewhere have conducted a considerable number of research projects, the results are widely scattered, and often inaccessible. There is a clear need for a central repository for environmental information and mechanisms to insure that such information is made available to both decision makers and the public.

SECTION IX

Recommendations for USAID/Rwanda

The objective of this assessment is to identify the likely impacts – both positive and negative - of the evolving strategic objectives on Rwanda's fragile natural resource base. The formal environmental requirements of USAID operating unit strategic plans are spelled out in ADS 201.3.8.2 Mandatory Technical Analysis for Developing Strategic Plans, Environmental Analysis, and are derived from provisions of the Foreign Assistance Act (FAA) including:

- Environmental Sustainability. Section 117 of the FAA *"Environment and Natural Resources,"* dictates that operating units will implement their programs with an aim toward maintaining (and restoring) natural resources upon which economic growth depends, and to consider the impact of their activities on the environment.

- Tropical Forestry and Biological Diversity. Sections 118 *"Tropical Forests"* and 119 *"Endangered Species"* of the FAA codify the more specific U.S. interests in forests and biological diversity. These two provisions require that all country plans include: 1) an analysis of the actions necessary in that country to conserve biological diversity and tropical forests; and 2) the extent to which current or proposed USAID actions meet those needs. Section 118/119 analyses are specific legal requirements of all USAID operating unit strategic plans.

- Agency Environmental Procedures. 22 CFR 216 provides the basis for the application of pertinent US environmental legislation and policy. This legislation and supporting guidance from USAID/Washington directs Missions to conduct assistance programs in a manner that is sensitive to the protection of endangered or threatened species and their critical habitats within the project activity cycle. While FAA Sections 117-119 address the analytic requirements for USAID Missions during the strategic planning process, 22 CFR 216 is designed to guide the evaluation and conduct of specific development interventions within the project development and management cycle.

Under USAID/'s last strategy, environmental activities primarily focused on 22 CFR 216 requirements. With the multitude of PERSUAP's, SO and project IEEs, USAID/Rwanda is to be commended on meeting or exceeding this requirement; few other USAID Missions have this stringent of an environmental review and compliance process nor been more active in working to define and mitigate possible shortcomings . However, the ETOA team noted some deficiencies in terms of approach.

First, for most of USAID's partners, the IEE's are somewhat of a paper exercise. Projects spend considerable amounts of time and effort in developing the IEEs, but due to other constraints, IEE's are not followed in the field, particularly monitoring and evaluation requirements. This is partly due to the misconception that environmental values are exogenous production factors and that the market does not award value for better management practices. The supply chain orientation that ADAR and the PEARL project are pursuing is now actively promoting

environmental stewardship as desirable outcomes that the market recognizes. Assuring that coffee, pyrethrum, organic produce and other commodities meet increasingly rigorous trade standards is an excellent example. Working to assure that renewable energy alternatives are pursued as a method of reducing product costs in pyrethrum and tea processing are also methods of reducing pressure on forests.

Second, although some lessons are being learned via the IEE process in the DAP projects, partners are having a difficult time incorporating these lessons into program redesign. Several partners mentioned to the ETOA team the desire to make the DAPs more responsive to lessons learned/current needs, but stated that to their knowledge, "DAPs are almost impossible to amend."

Third, other than project staff, who may or may not be qualified to conduct IEEs, there is very little local capacity to conduct them in Rwanda. In fact, one of USAID's partners, put an IEE for bridge rehabilitation out to bid and received only one $28,000 proposal three months later; the cost of the IEE would have been more than the cost of the bridges. Increasing enterprise and public sector access to qualified environmental engineers and impact specialists remains a significant and strategic obstacle to reducing the costs of more sustainable activities across all sectors in Rwanda.

Finally, the ETOA team believes that Mission's focus on regulatory compliance has, to a certain extent, caused USAID to lose sight of the bigger environmental picture. Environmental compliance approaches, and mitigation and monitoring during implementation, seek to reinforce the objective of mainstreaming environmental quality into development practice while recognizing the real limitations of the public sector in Rwanda. The assertion is that environmental compliance draws attention to the bigger picture by providing for an approach to focus on "doing no harm" at an operational level.

However, in the ETOA team's opinion, this assertion may not be true. Regulatory compliance to date has done little to alleviate Rwanda's major environmental problems which are very real and very serious. The destruction of Gishwati and Mukura rainforests (and no donor or NGO assistance in environmental mitigation planning for resettlement of these forests) means that over 70% of Rwanda's water resources are now coming from the Nyungwe forest watershed. Degradation of Nyungwe combined with expanded wetland and marshland draining for agriculture production could spell environmental disaster for Rwanda in the not so near future. Similarly, the complete existence of Akagera National Park, a goldmine of ecosystems and biodiversity, is under immediate threat by the 150,000 head of cattle that illegally graze in the Park and proposed buffer zone on a daily basis.

It is clear to the ETOA team that although compliance often stimulates attention to areas that otherwise might have been overlooked (e.g., the medical wastes issue in the health program), compliance alone is not enough and the Mission needs to focus more attention on environmental program issues. In the case of Rwanda attention to compliance is important but may inadvertently draw very limited resources into regulatory approaches when market-based solutions will have more long-term yields.

Prior to 1992/93, USAID/Rwanda's very successful contribution to Rwanda's environmental sector (particularly forests and biodiversity) was done through initiatives such as the Natural Resources Management Project, the CARE/Gituza Refugee Reforestation Project, the Farming Systems Research Project, and the Ruhengeri Resources Analysis and Management Project which sought ways to actively promote sustainable land stewardship through production. While the team supports the Mission's current proposed strategy, we believe that its contribution to the first part of Section 117 – "maintaining (and restoring) natural resources upon which economic growth depends" – will at most be only slightly environmentally positive, if not neutral unless there is a sustained effort to incorporate environmental concerns into agriculture practices.

As an alternative to rebuilding a large, stand-alone biodiversity or natural resources management program, the ETOA team has identified activities under USAID's proposed plan that might be modified to help meet significant forestry and biodiversity conservation needs in Rwanda, and that promote synergy between the SOs. Moreover, the proposed integration of biodiversity and forestry issues into the Mission's general programs is the most promising approach to establishing essential conditions for conservation while meeting the overall objectives of social and economic stability. Including natural resources management as an active element of the economic growth and competitiveness strategic objective offers the best probability of addressing resource stewardship.

On a general level and in the short-term, the ETOA team recommends that USAID regain its seat at the environmental policy table. In particular, USAID should be more proactive in the following areas:

- Push for the passing of REMA legislation and help get REMA up and running once the legislation is passed and consider ways in which it can support the rolling out of operational policy and measurable norms once the Framework Law on the Environment is passed. Unless there is multilateral support for pushing this important law to implementation there are real reasons to be fearful for Rwanda's crumbling environment, particularly surface water contamination, deforestation, and the loss of remaining biodiversity;

- Continue to work with primary partners (ADAR, ACDI/VOCA and PEARL) to assure that all projects addressing agribusiness development maintain a key focus on assuring producers and processors are aware of supply chain requirements for environmental and social values. Seminars for decision makers, training for enterprise and environmental authorities in evolving supply chain grades and standards, and attention to assuring that processors are internalizing environmental costs through application of clean and appropriate technology will help balance the regulatory approaches with evolving market forces

- Provide more input into resolving major biodiversity issues. For example, the rehabilitation of ANP would make a considerable contribution to Rwanda's tourism circuit (and tourism revenue), giving tourists coming to see the gorillas an opportunity to visit a small, but biologically diverse part of the east African wildlife scene without the additional expense of going to Kenya and Tanzania. Before this can happen, however,

the grazing issue needs to be resolved and addressed at the highest levels of government, and both donor, including USAID and civil society pressure need to be brought to bear on the subject.

- Draw on REDSO/ESA REO assistance to help the GOR develop an environmental strategy for both refugee relief and other emergency/disaster activities, and resettlement villages. Much of the degradation of Gishwati and Mukura Forest Reserves could have been prevented if donors, international agencies and the GOR had worked together to develop a resettlement environmental mitigation strategy.

- Help build local capacity for conducting IEEs and EIAs. (NB: The Mission is already taking steps to address this shortcoming. REDSO/ESA's Regional Environmental Advisor will be conducting an IEE training course for local NGOs and other USAID partners in March 2003, but this effort will need to be reinforced over the long-term).

- Continue to promote a balanced, transparent and accountable system of governance across SOs. One cannot really separate the population, economic and resource issues from the political. A well-ordered public welfare oriented society with an appropriate policy and regulatory environment allows decentralized management of resources and private initiative to achieve an equitable distribution and use of natural, social and political resources. Rwanda unquestionably could come to grips with its resource limitations by focusing on sustainable intensification of and equitable access to resources.

A. Potential Linkages between the Environment and the ISP

A.1 SO1: Increased Citizen Participation in Post/Transition Governance

Environmental Review

The SO1 team maintains an on-going environmental review process for sub-grants under the International Rescue Committee's Decentralization and Good Governance Project in Kibungo. The project uses guidelines for the environmental impact assessment (EIA) of community development projects developed by Dr. Gaspard Bikwemu under the old Africare project. These guidelines focus mainly on construction-type projects (schools, health centers, markets, slaughterhouses, water supply, power supply, and road/bridge rehabilitation), but also provide guidelines for agricultural projects including wetlands development. However, an independent review (Knausenberger et al 2002) review of the EIA process suggests the following:

- Emphasis seems to have been too strongly upon "compliance" with USAID "requirements" when in fact the main point was to elicit thinking about alternatives and better design and choices;
- Seemingly less emphasis was placed upon capacity building in which environmental review was a promoted as a way to enhance the participatory consensus as to how to increase the quality of the infrastructure proposed;
- Little or no reference to GOR environmental procedures was made in the entire program, and little provision for training and sensitization of MINALOC staff in this respect was done.

Opportunities and Entry Points

1. **Strengthen the IRC Decentralization and Good Governance subgrant component by:**

- Assisting communities to internalize the environmental review process and environmental capacity building at the outset of community development activities;
- Encouraging community-based application of environmental assessment skills though local NGOs and community-based organizations;
- Adopt informal education methods which can empower the illiterate as well as the literate.

2. **Strengthen civil society organizations that promote environmental management**

A number of Rwandan NGOs are actively engaged in environmental education, community conservation and other environmental initiatives. Select NGOs can be strengthened (via subgrants) in their work to empower communities to effectively manage natural resources. Nationally based NGOs could also be supported to develop stronger advocacy for environmental issues. In particular, USAID should encourage NGOs to refocus their emphasis on environmental or ecological issues to address issues of land and resource rights. This may help to shift the emphasis from preventing perceived degradation of the environment to advocating for and defending the rights of the landless and the rural poor. There is no doubt that dealing with the issue of land and resource rights in a considered and open way at the level of policy making to the level of local level dispute resolution will have enduring benefits for peace building in Rwanda.

USAID should also continue to examine ways to work with international foundations that support NGOs and CBOs operating in Rwanda (e.g., Diane Fossey/Europe, AWF, WCS). Linking local environmental NGOs with local family planning NGOs to develop joint programs would promote synergy between SO1 and SO2. Technical assistance (e.g., agriculture, environment, natural resources) for developing this opportunity would come from the SO3 team, thus promoting additional synergy.

3. **Environmental Capacity Building for Local Government**

The capacity for the environmental management and protection at the local government level - Province, District, Sector and Cell - is very limited. A the Provincial level, the Directorate in Charge of Technical Affairs and Infrastructure, is in charge of environment, forests, agriculture and livestock services. A major point of entry in beginning to build environmental capacity at the local level would be to, with the support of the Prefect, convert much degraded national and district-owned forest plantations to long-term leasehold status to be managed by farmers groups or associations. A possible scenario would be to have the Fiscal Decentralization project and either PEARL, ADAR and/or ACDI/VOCA projects work together in collaboration with MINAGRI and MINALOC to:

- Identify potential Districts;
- Identify potential farmers groups/associations in those Districts;
- Develop polices and implementation strategies, including leasehold criteria (e.g., long-term, at least 25 years to encourage ownership of and investment in the resource; would require a management/business plan with harvesting schedules/provision for replanting; revenue projections; and concession fees). (NOTE: The ETOA team was informed by the Minister for Forestry that a draft *Arrêté Ministeriel* is currently being prepared which would address the subject. The *Arrêté* provides 30-year leases for groups and private individuals to manage state forests providing they can demonstrate capacity.);
- Work with groups to secure leases and provide training in forest and business management.

The ETOA team believes that this type of activity would result in a win-win situation for all concerned. Although Districts would lose the revenues from the plantations, this loss would be more than made up by increases in production due to better management and protection, which would be reflected in the concession fees. Increased wood supplies from leasehold forests reduce pressure on natural forests and provide significant income generating opportunities for local populations. Finally, as the Fiscal Decentralization project is required to assist the GOR to decentralize two services[15], the ETOA team believes that forestry presents the best opportunity for the second service. Moreover, focusing on forestry would also lay the groundwork for the eventual decentralization of other natural resource related services, particularly agriculture.

4. Improve district land use planning

In the longer term, USAID needs to begin to think about helping provincial and district governments prepare land use plans to serve as a foundation for long-range fiscal and programmatic planning, monitoring of resource use, tax base projections, and zoning to support the value of land and resource concessions

A.2 SO2: Improved use of community health services in selected health districts

Environmental Review

This SO has developed a "Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP)" for insecticide treated nets. This PERSUAP addresses pesticide safe use and handling issues for the PSI/Rwanda led social marketing of ITN (SUPANET and Karishya SUPANET retreatment) use in Rwanda, and represents Rwanda's environmental review and risk/benefit assessment regarding the use of deltamethrin (a WHO-approved synthetic pyrethroid, soluble concentrate 1% and the 25% wettable tablet -- K-O tab home treatment kits). The PERSUAP also addresses issues regarding the environmental, institutional and social setting within which the insecticide is used. PSI/Rwanda is handling, storing, packaging and disposing the insecticide carefully and distributes and educates the population about the product.

Opportunities and Entry Points

[15] The Fiscal Decentralization project has already chosen health as the first service to decentralize.

1. Strengthening family planning programs in environmentally sensitive areas

Excessive population growth coupled with increased resource use and poor resource management are key elements driving the degradation of remaining forests and biodiversity in Rwanda. Family planning messages that illustrate overpopulation's impact on natural resources are valuable. Not only do large families require more time and labor inputs to provide basic food and shelter requirements, but larger families (taken collectively) also tend to have a larger negative impact on available natural resources. More marginal land needs to cultivated, more wood needs to be collected to help cook for the family and more water resources are required for basic needs and drinking. Large families make it more difficult to survive, or even maintain an acceptable quality of life. Where effective family planning programs are in place, these effects lessen.

Strong synergies are possible between this SO and natural resources conservation, especially in areas of rich biodiversity such as PNV and Nyungwe. Environmental awareness activities could also be included as an expansion of the population awareness efforts under the health SO, using the same grantees and awareness techniques that have already been developed for targeted Rwandans but with different messages. (This would also respond to FY2002 Foreign Operations, Export Financing, and Related Programs [Foreign Operations] Bill which includes new language concerning the use of family planning/reproductive health funds. See Annex F.)

2. Develop program for medical waste disposal with current partners.

- Assist in developing a national strategy for medical waste disposal, update legislation as required. To be done collaboratively with MINISANTE and MINITERRE with active participation of other partners (health center personnel, district administration, NGOs and the private sector);
- Develop environmental guidelines for siting waste disposal sites at health centers; ensure MOH design of incinerators is adequate for proper incineration;
- Develop publics awareness campaign on dangers of handling medical waste;
- Provide training in medical waste management to health center personnel, particularly those charged with maintenance and disposal;
- Asses whether MOH plans for incinerators meet international standards and propose design changes if necessary.

3. Conduct a follow-up, "good services survey" with users of treated mosquito nets.

Although the PERSUAP for treated mosquito nests provides guidelines for use, there is no follow-up or "good services" survey to see if the messages (box instructions, training, etc.) are actually being received and effectively used by the intended audience. There appears to be a need for some sort of a follow up survey to judge impact and redesign communications messages if necessary, perhaps in conjunction with the WHO Roll Back Malaria Program, if they are not already doing so.

A.3 SO3: Expanded economic opportunities in rural areas

Environmental Review

Given the nature of SO3, the SO3 team has perhaps been the most active in terms of environmental compliance activities:

- IEEs have been prepared and approved (or are pending approval) for all Development Assistance Projects (DAPs – Catholic Relief Services, World Vision, ACDI/VOCA and World Learning);
- A Pesticide Evaluation Report and Safer Use Action Plan for Rwanda Crop Protection and Commodity Protection has been prepared;
- A study on "Environmental Management Systems for Agribusinesses in Rwanda" was prepared under the ADAR project, and provides an example of environmental mainstreaming and capacity building for environmental management.
- Proposed March 2003 training for local NGOs and other organizations on IEEs and "Cleaner Production" through REDSO/ESA;
- Although not directly supported by USAID/Rwanda, the GOR is currently implementing a water hyacinth control program through rearing and release efforts, which were in the past, assisted by Clean Lakes, Inc. (CLI), under cooperative agreement funding from USAID/Uganda.

Opportunities and Entry Points

1. Increasing off forest production of and market potential and/or adding value to NTFPs (bamboo, honey, medicinal plants.)

Throughout Rwanda, NTFPs are gathered for use as foodstuffs, building materials, medicinals, etc. Some of these products have very high market values. Medicinal extracts from species such as *Eucalypyus globlus*. *Plantago lanceolata*, *Tetradenai riparia*, *Datura stramonium*, *Neorautanenia mitis* and *Ocimum spp*., generated over 2 million RRF in revenue in 1999. There are, however, two problems with regard to medicinals:

- There are very few programs which deal with off forest/on farm propagation of these plants (although World Relief will be starting in February with Eucalyptus and geraniums). Most production is now done by the Centre Pharmacopee of IRST in Butare, with no out grower program.
- Most local communities gathering these products in the wild rarely have access to larger markets. Instead, they tend to harvest products, which they in turn sell to an intermediary (or a chain of intermediaries). Those harvesting the NTFPs, perhaps out of lack of awareness or more likely due to better access to markets, tend to receive very little money for their effort. As a result there is a strong tendency to increase the amount of plants/products harvested to increase the overall financial yield. This pressure to harvest greater quantities for external markets can lead to unsustainable levels of removal for many NTFPs.

USAID could address these problems/support on farm (and sustainable in forest) activities through both the PEARL and ADAR projects, thus conserving biodiversity and increasing income earning opportunities for populations surrounding protected areas. USAID/AFR/SD's Agribusiness in Sustainable African Natural Plant Products Project may also be able to assist with this component.

- Of particular interest is the tea around Nyungwe which is of very high quality and could be marketed as rainforest tea and other green labeling if linked more closely to the management of Nyungwe forest. Green labeling could be used to increase the price of the product and help it better link to fair trade groups that are willing to pay higher prices.
- Honey also presents another opportunity for development. The introduction of improved hives, combined with training for producer organizations could result in a high quality product, while reducing the incidence of forest fires. The PEARL project is considering exploring this option.

2. Promote forest plantation-based small-scale private industries.

In conjunction with the plantation forest privatization activity mentioned in SO1 above, partners under SO3 (ADAR, PEARL and ACDI/VOCA) could assist farmers groups and associations with the establishment of small scale wood-based enterprises, from commercial marketing of firewood and construction poles to small sawmills and furniture making. A key element of this support would be to enhance both the technical and business capacity of these groups.

3. Support research/studies on biodiversity and the better integration of environmental improvements in Rwandan farming systems.

In particular, USAID should consider supporting through NUR/ISAR:

- A comparative benefit cost analysis of terracing techniques;
- A socio-economic analysis of the use of different terracing techniques in the farmer's "landscape".

The PEARL project is currently considering establishing a small grants program for University and ISAR researchers to work on applied production issues related to the project. This grants program could be expanded to include applied, multi-disciplinary research on environmental issues, perhaps under the newly created Environmental Research Coordination at NUR.

USAID should also consider providing additional support to NUR's Geographic Information/Remote Sensing Center for protected/critical area mapping, and for data collection and dissemination.

4. Modify Development Assistance Projects to better reflect current socioeconomic and environmental reality

A. **Encourage an integrated, landscape (hillside and wetland) approach to agriculture development in the DAPS.** Marshland agriculture, including swamp tea production, is very vulnerable to upstream land use decisions which accelerate runoff and cause flooding. Deforestation, expansion of agriculture into critical gallery forests and ravines, lack of terracing or mulching on subsistence crops, and hillside water retention are all directly responsible for the increased flooding that irrigated crop producers now face. Silting of the marshlands and the dramatic shifting of the peat "plates" that underline most *marais* and wetlands are causing a reduction in the area under cultivation. Projects/producers are now faced with costly water retention and drainage investments to control water during the rainy season while assuring minimum water requirements during the dry season. Working more closely with local government in the delimitation of critical watershed areas, the establishment of private and commercial fuelwood plantations combined with an integrated hillside-wetlands approach could have significant and positive impacts. Part of the hillside approach would be to draw on the above studies to better place different terraces on different parts of the farmer's landscape.

B. **Ensure environmental and economic/financial sustainability of rehabilitated wetlands**

- Refine and ensure the application of ecological criteria for the selection of marshlands to be rehabilitated;
- Front end PRAs or other types of social assessments to identify constraints to long term ownership and maintenance of wetlands infrastructure, and develop measures to mitigate those constraints.
- Develop a simple environmental monitoring program for each DAP in order to make mid course corrections to project implementation.

C. **Be cautious in the use of FFW (monetized or other) in supporting on-farm activities.** The ETOA team questions the practice of paying farmers to make environmental improvements such as terraces, on their own land. The majority of research on this subject as well as discussions with several organizations involved in terracing in Rwanda, suggest that this practice is neither economically or environmentally sustainable. Economically, the cost of digging "terraces radicals" (the GOR preferred terracing system) on all of Rwanda's hillsides would be staggering. Additionally, improperly maintained radical terraces (which is usually the case when farmers are paid to dig the terraces – no sense of ownership), can actually increase soil erosion, particularly gully erosion.

5. Consider the use of FFW (monetized or other) for public works type activities in and around national parks and forest reserves. Many of the Parks in the United States as well as the windbreaks across the Great Plains were established during the Great Depression by one of the most famous public works programs, the Civilian Conservation Corps (CCC). A small CCC could be established for Rwandan Parks which would encourage surrounding populations participation in Park activities (e.g., trail, road, bridge and building maintenance and other), and

provide an income earning opportunity pending development of alternative opportunities noted above.

6. Limit USAID support to methane extraction to:

The provision of assistance to the GOR on the development of environmental guidelines for methane extraction. Currently, Rwanda law requires that the above companies conduct an EIA on platform establishment. However, to the team's knowledge, there are no guidelines available for such assessments. As it appears that USAID is somewhat committed to assist the GOR with methane development, the ETOA team believes that the best course of action would be to use STTA assist the GOR (MINITERRE) in developing environmental guidelines and terms of reference for Environmental Impact Assessments for the construction and operation of the extraction platforms, including guidelines for monitoring both atmospheric and lake environments. The STTA should also examine GOR capacity and technical support for the environmental monitoring of this type of technology. (This should also satisfy USAID compliance requirements.)

In the future, however, given USAID's limited (and declining) resources, the ETOA team believes that in the medium term, it would be better to promote private sector fuelwood and other alternative energy sources instead of methane given methane's cost compared to fuelwood, and its limited substitution potential.